0057E1 "0202260

FIG. 1

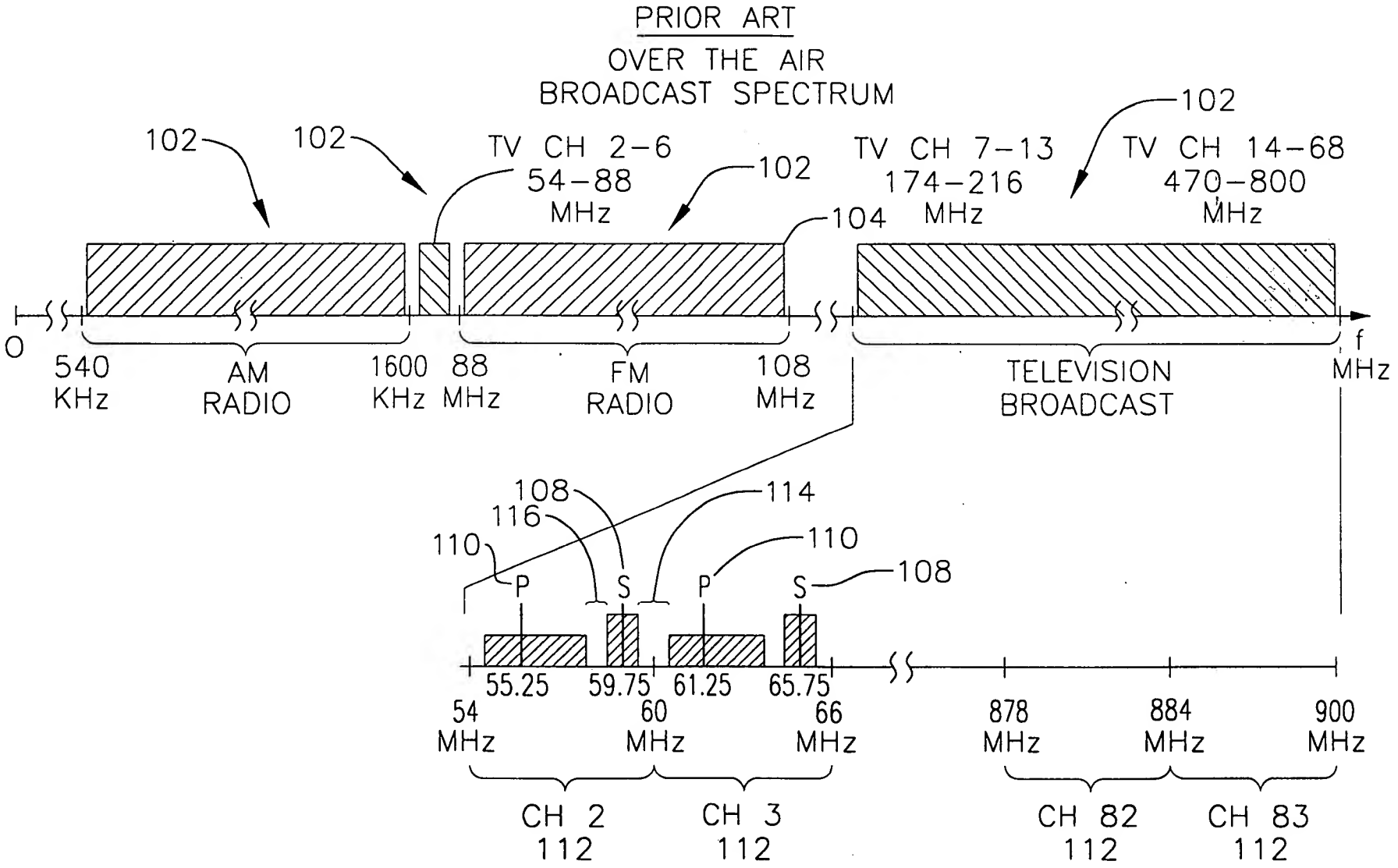


FIG.2

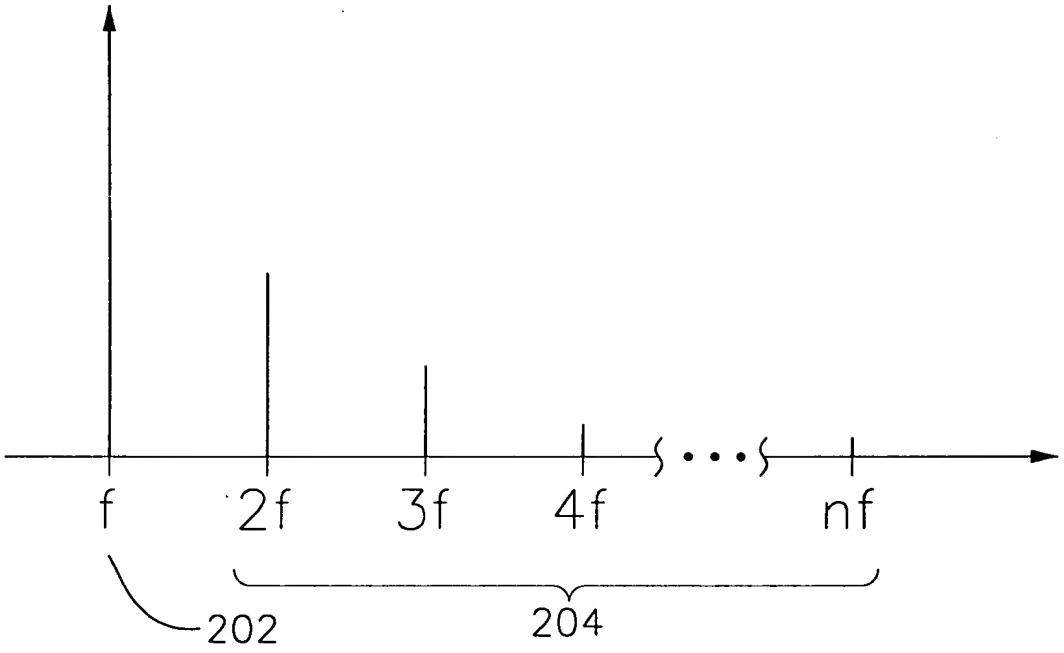
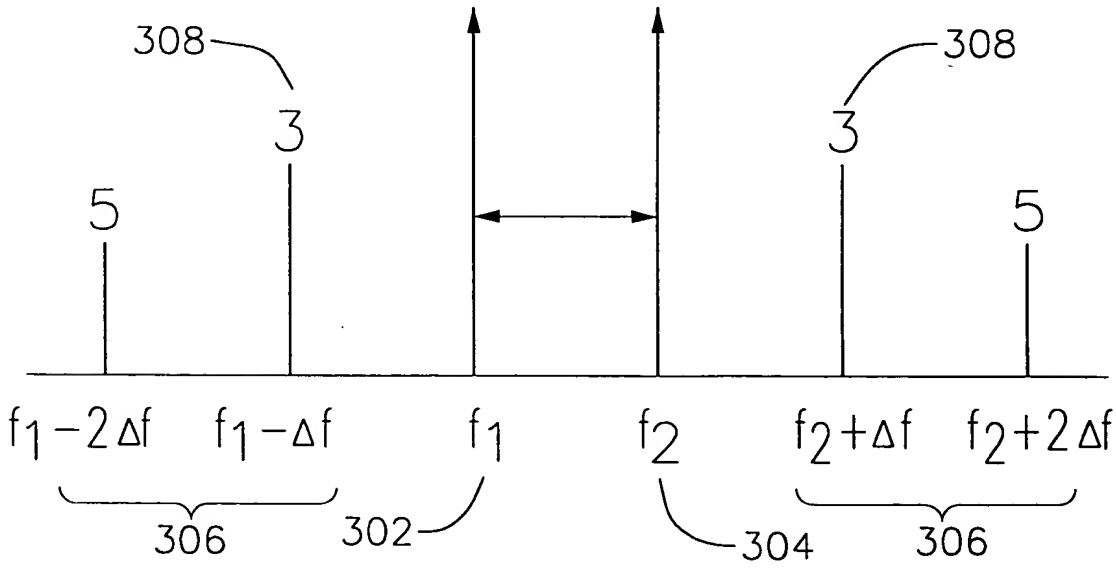


FIG.3

PRIOR ART



Docket 010620

FIG. 4

PRIOR ART

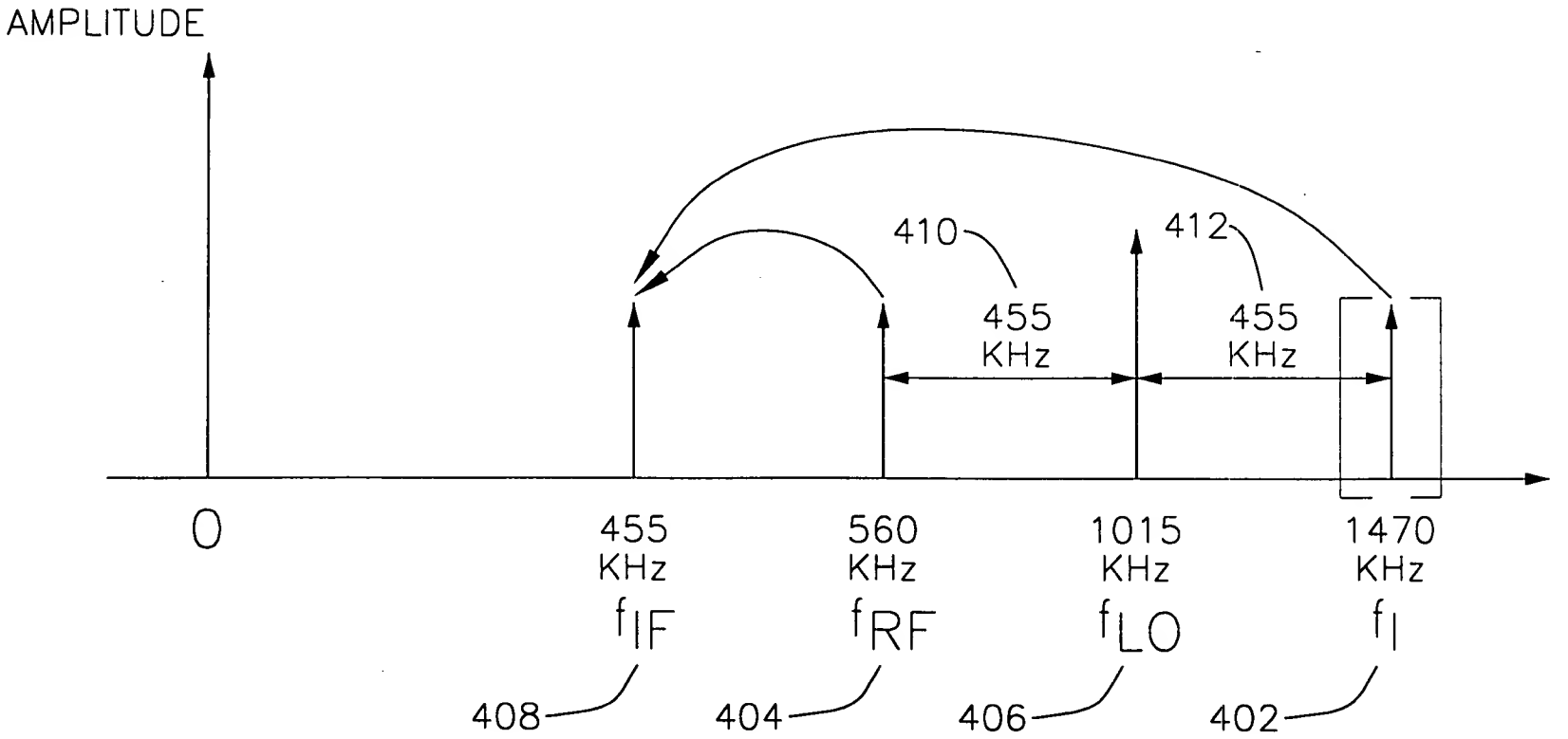
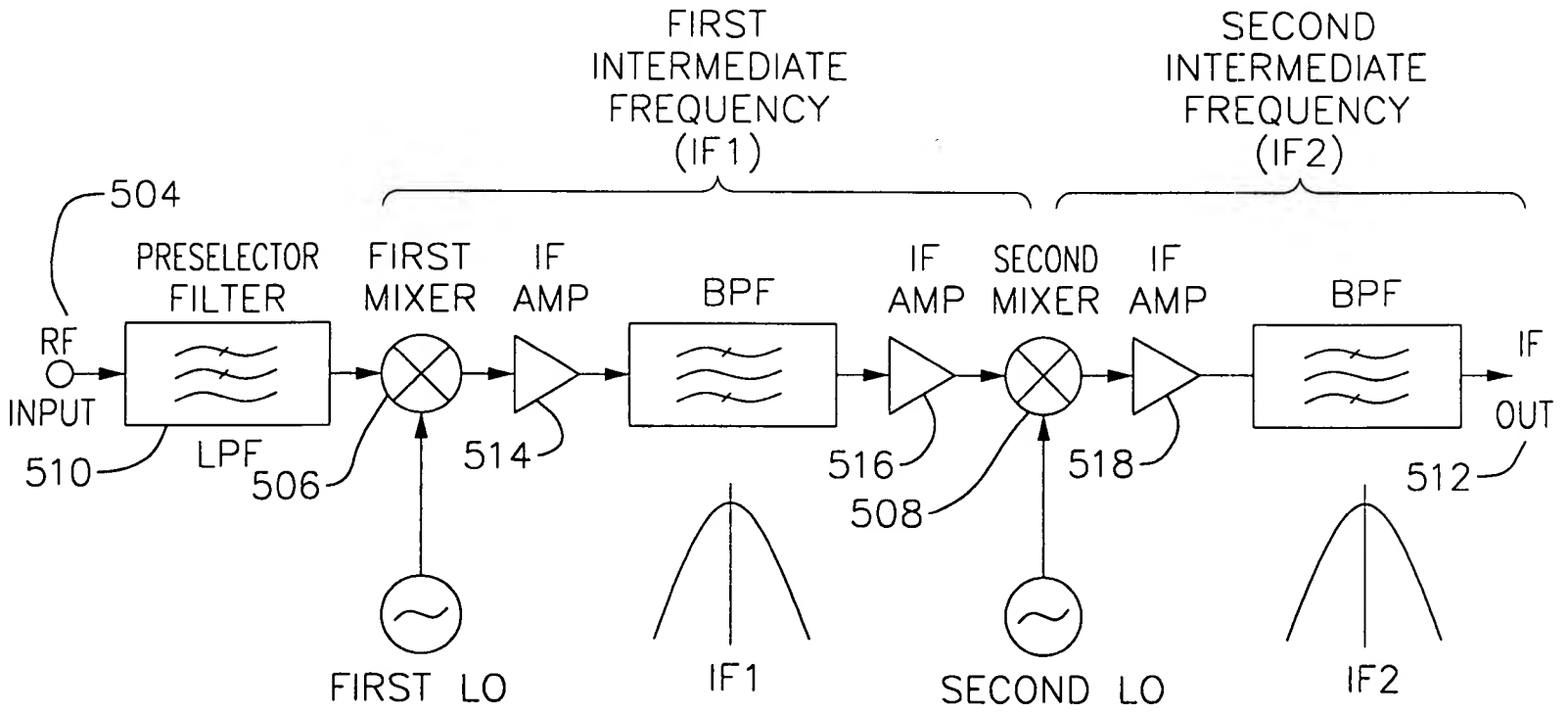


FIG.5

DUAL CONVERSION RECEIVER



IF2<RFINPUT<IF1

FIG. 6

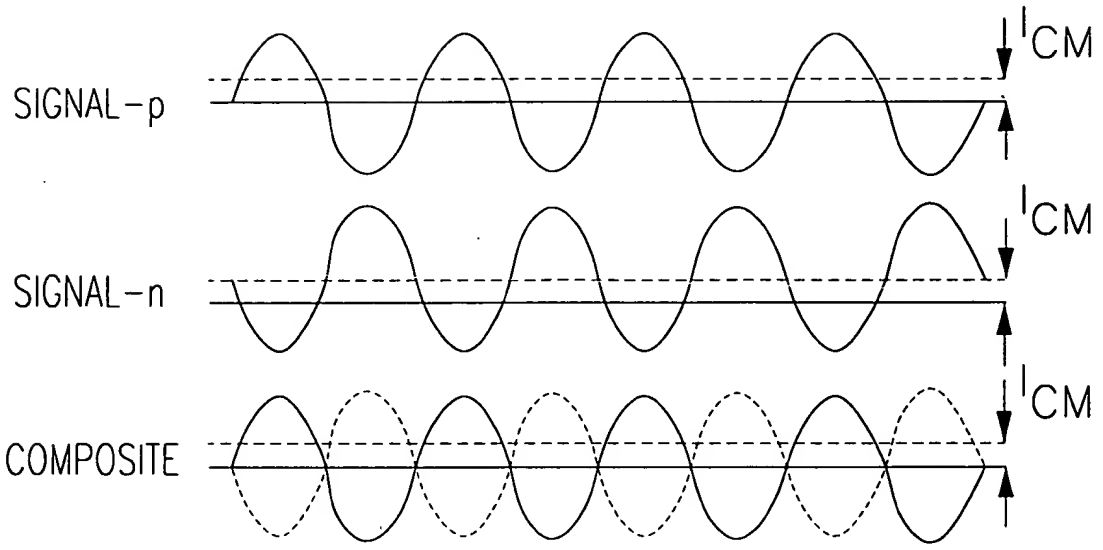

SIGNAL-p
SIGNAL-n
COMPOSITE
ICM
ICM
ICM

FIG. 7

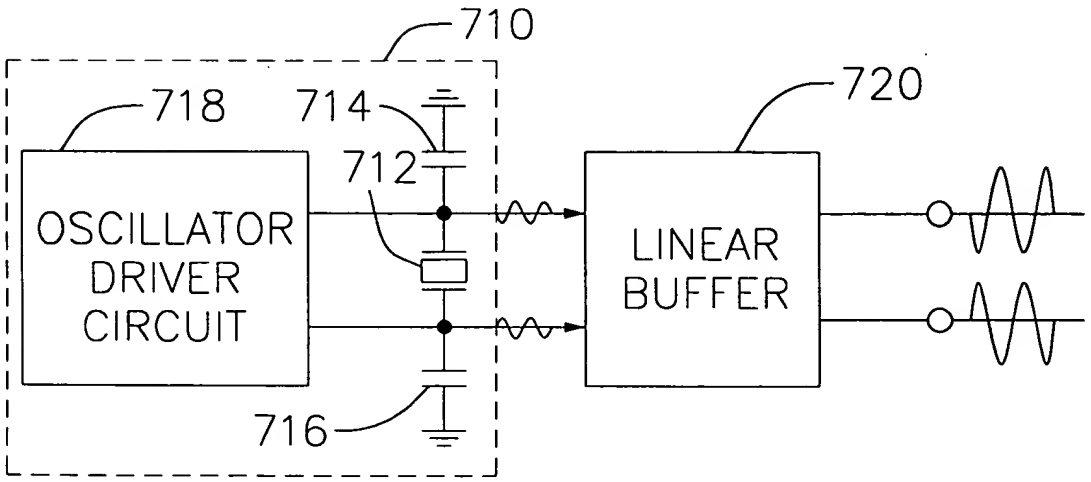

710
718
714
712
720
OSCILLATOR DRIVER CIRCUIT
LINEAR BUFFER
716

FIG. 8

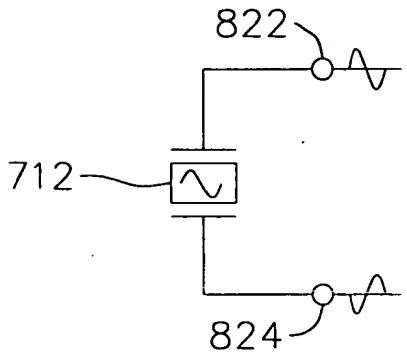


FIG. 9

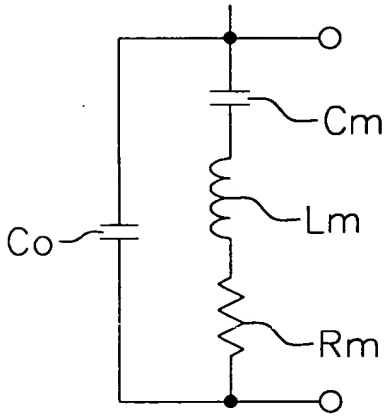


FIG. 10

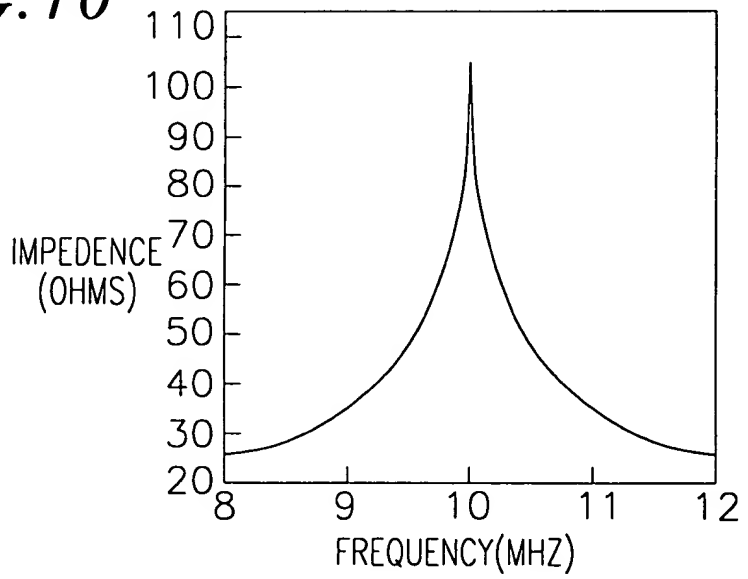


FIG. 11

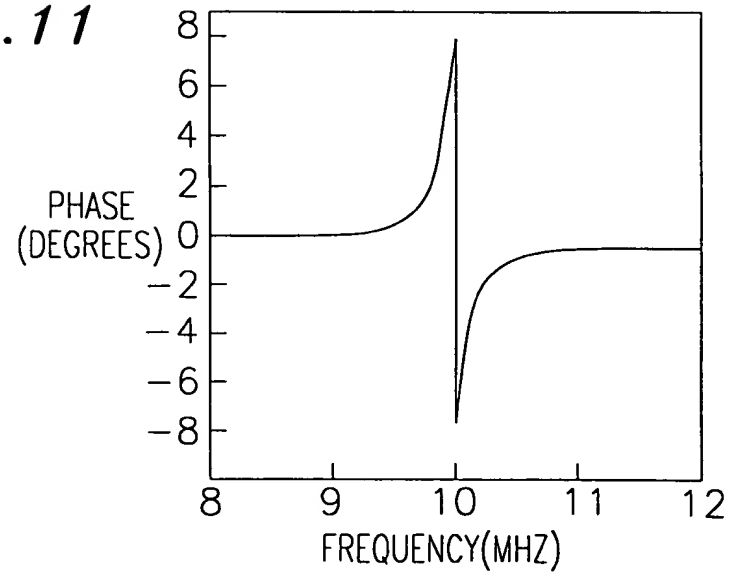


FIG. 12

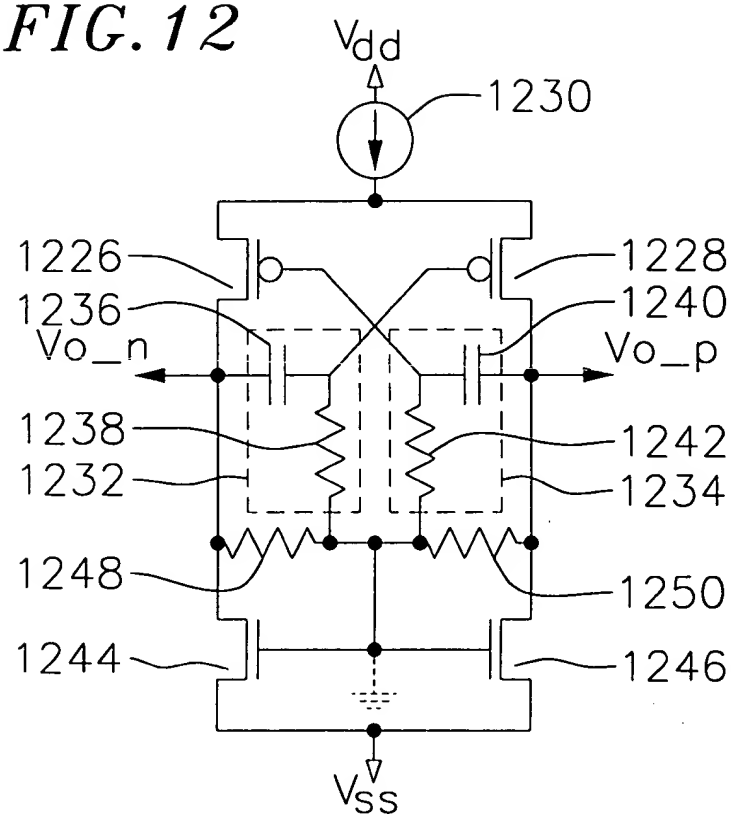

Vdd
1230
1226
1228
1236
1240
Vo_n
Vo_p
1238
1242
1232
1234
1248
1250
1244
1246
Vss

FIG. 13

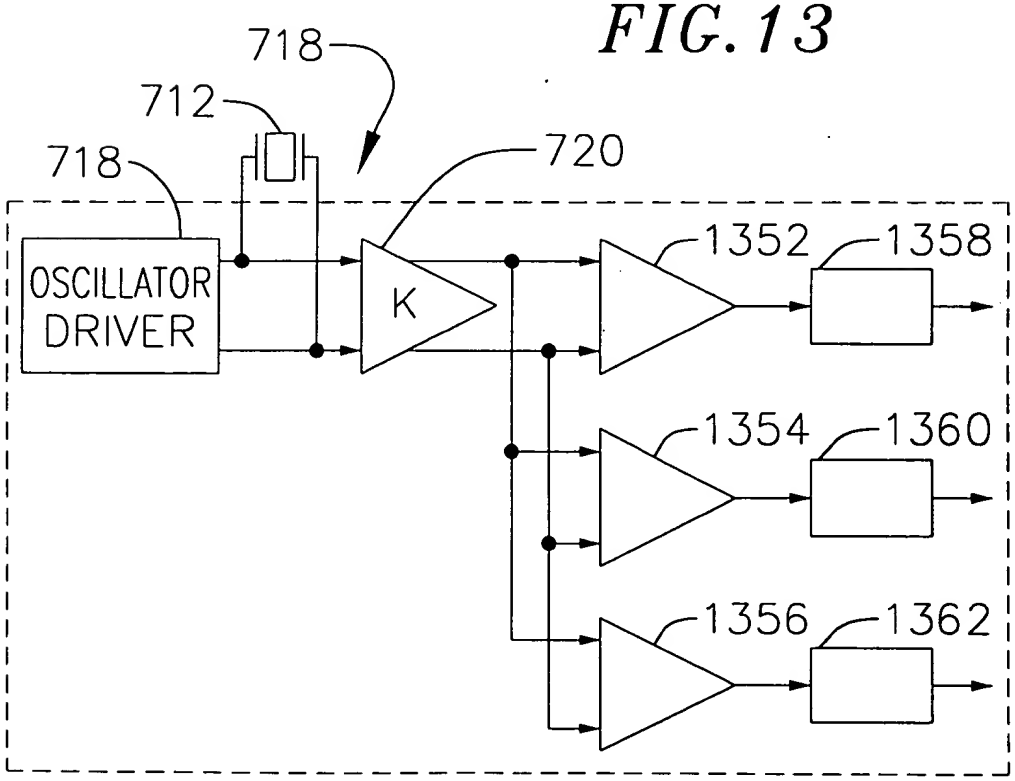

718
712
718
720
OSCILLATOR DRIVER
K
1352
1358
1354
1360
1356
1362

FIG. 14

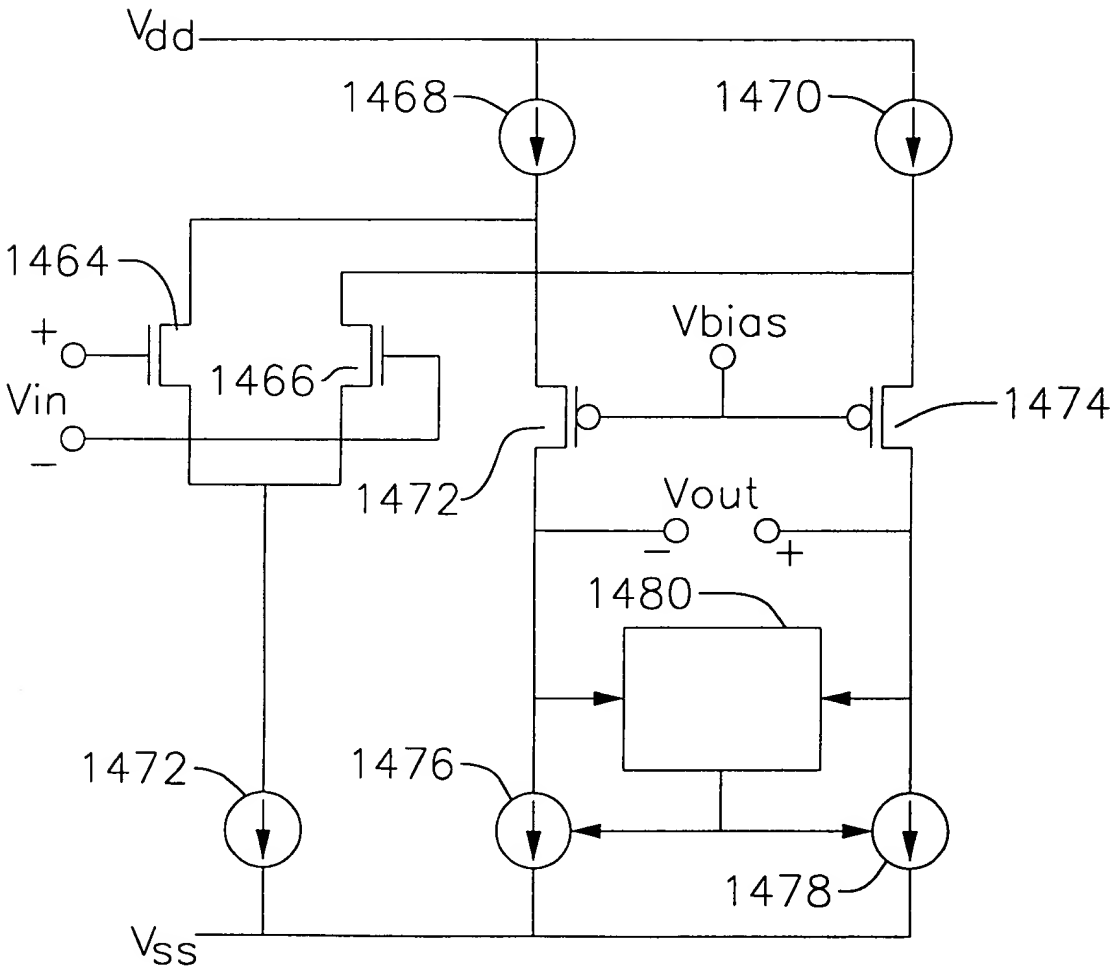

Vdd
1468
1470
1464
+
Vin
−
1466
Vbias
1474
1472
Vout
−
+
1480
1472
1476
1478
Vss

FIG. 15

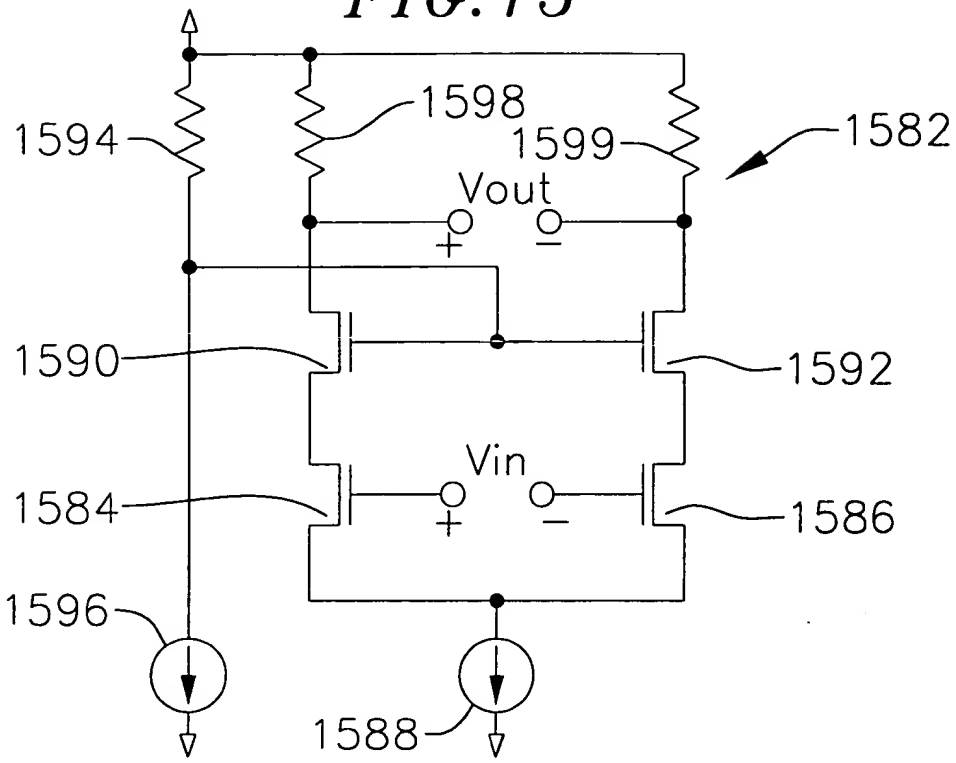

1594
1598
1599
1582
Vout
+
−
1590
1592
Vin
1584
1586
1596
1588

FIG. 16

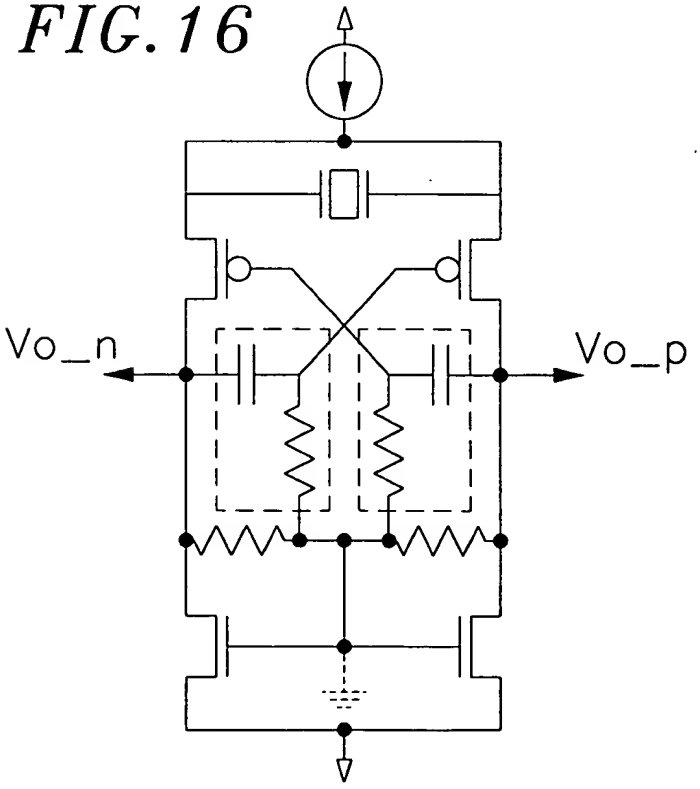

Vo_n
Vo_p

FIG. 17

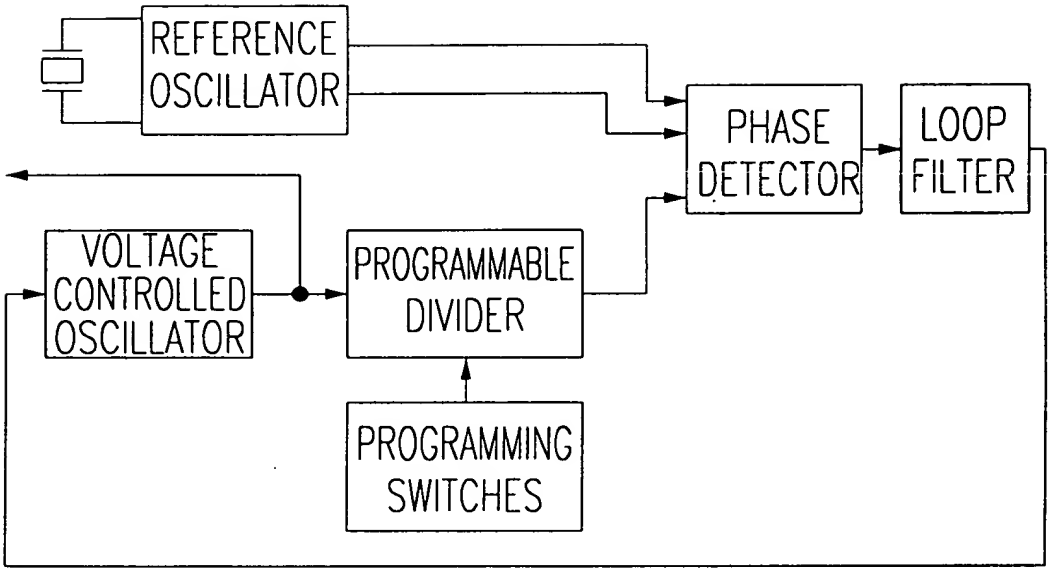

REFERENCE OSCILLATOR
PHASE DETECTOR
LOOP FILTER
VOLTAGE CONTROLLED OSCILLATOR
PROGRAMMABLE DIVIDER
PROGRAMMING SWITCHES

FIG. 18

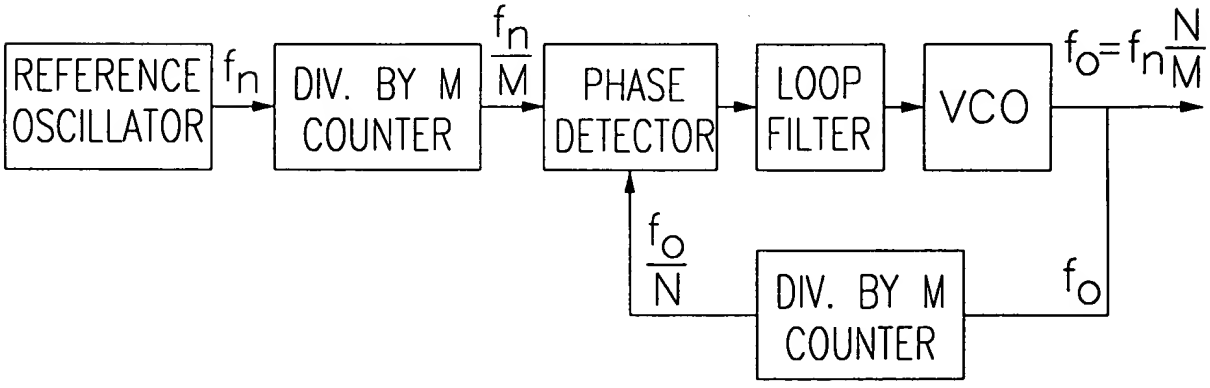

REFERENCE OSCILLATOR
f_n
DIV. BY M COUNTER
$\frac{f_n}{M}$
PHASE DETECTOR
LOOP FILTER
VCO
$f_O = f_n \frac{N}{M}$
$\frac{f_O}{N}$
DIV. BY M COUNTER
f_O

FIG. 19

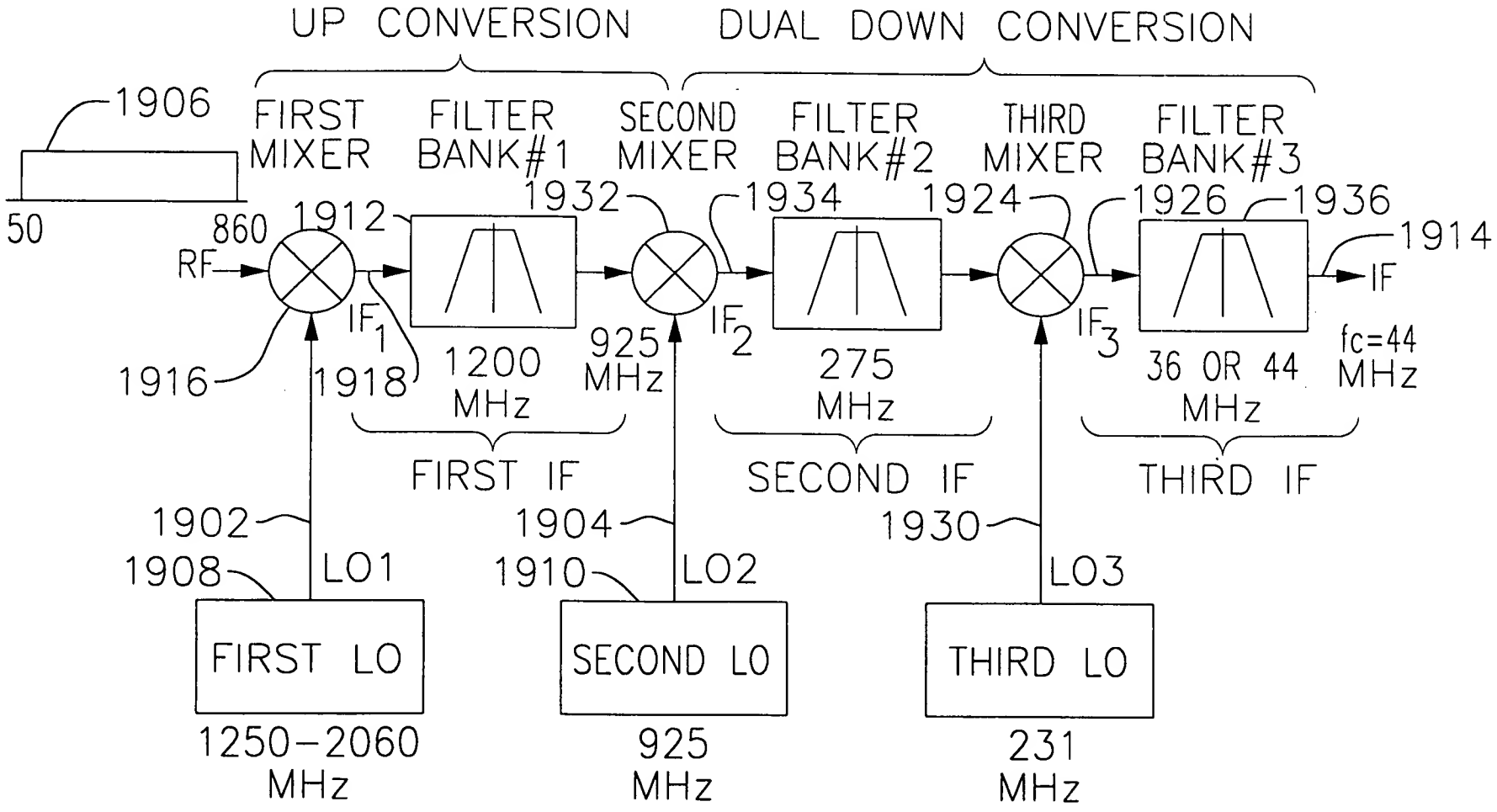
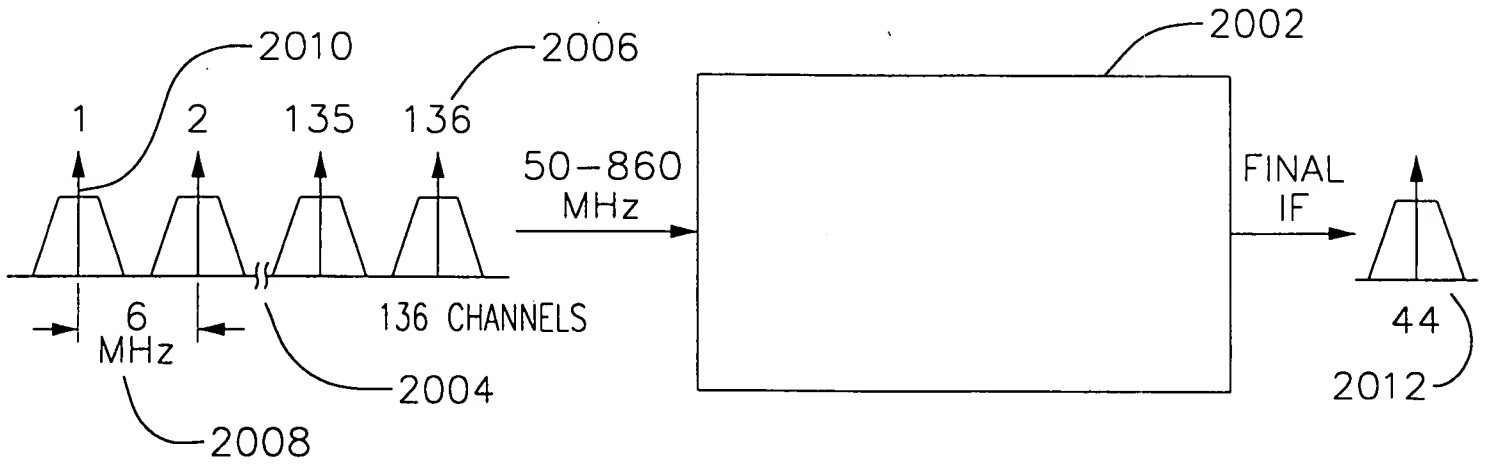

UP CONVERSION
DUAL DOWN CONVERSION
1906
FIRST MIXER
FILTER BANK#1
SECOND MIXER
FILTER BANK#2
THIRD MIXER
FILTER BANK#3
50
860
RF
1912
1932
1934
1924
1926
1936
1914
IF
IF1
IF2
IF3
1916
1918
1200 MHz
925 MHz
275 MHz
36 OR 44 MHz
fc=44 MHz
FIRST IF
SECOND IF
THIRD IF
1902
1904
1930
1908
LO1
1910
LO2
LO3
FIRST LO
SECOND LO
THIRD LO
1250–2060 MHz
925 MHz
231 MHz

FIG.20


2010
2006
2002
1
2
135
136
50–860
MHz
FINAL
IF
6
MHz
136 CHANNELS
44
2004
2012
2008

PPL Xtal REFERENCE=10MHz
LO-1, 10MHz FREQUENCY STEPS
LO-2, 100kHz FREQUENCY STEPS

FIG.21

44MHz IF

TABLE OF FREQUENCIES BASED ON COARSE/FINE PLL SOLUTION:

NOTE
- LO-2 REF=100KHz
  SO DIVIDE RANGE=9216 TO 9280

Frf (MHz)	50	56	62	68	74	80	86	92	98	104	110	116	122	128	"	854	860
LO-1 (MHz)	1250	1260	1260	1270	1270	1280	1290	1290	1300	1300	1310	1320	1320	1330	"	2050	2060
IF-1 (MHz)	1200	1204	1198	1202	1196	1200	1204	1198	1202	1196	1200	1204	1198	1202	"	1196	1200
LO-2 (MHz)	924.8	928.0	923.2	926.4	921.6	924.8	928.0	923.2	926.4	921.6	924.8	928.0	923.2	926.4	"	921.6	924.8
IF-2 (MHz)	275.2	276	274.8	275.6	274.4	275.2	276.0	274.8	275.6	274.4	275.2	276.0	274.8	275.6	"	274.4	275.2
LO-3 (MHz)	231.2	232	230.8	232	230	231	232	231	232	230	231	232	231	232	"	230	231
IF-3 (MHz)	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	"	44.0	44.0

PPL Xtal REFERENCE=10MHz
LO-1, 10MHz FREQUENCY STEPS
LO-2, 100kHz FREQUENCY STEPS

FIG.22

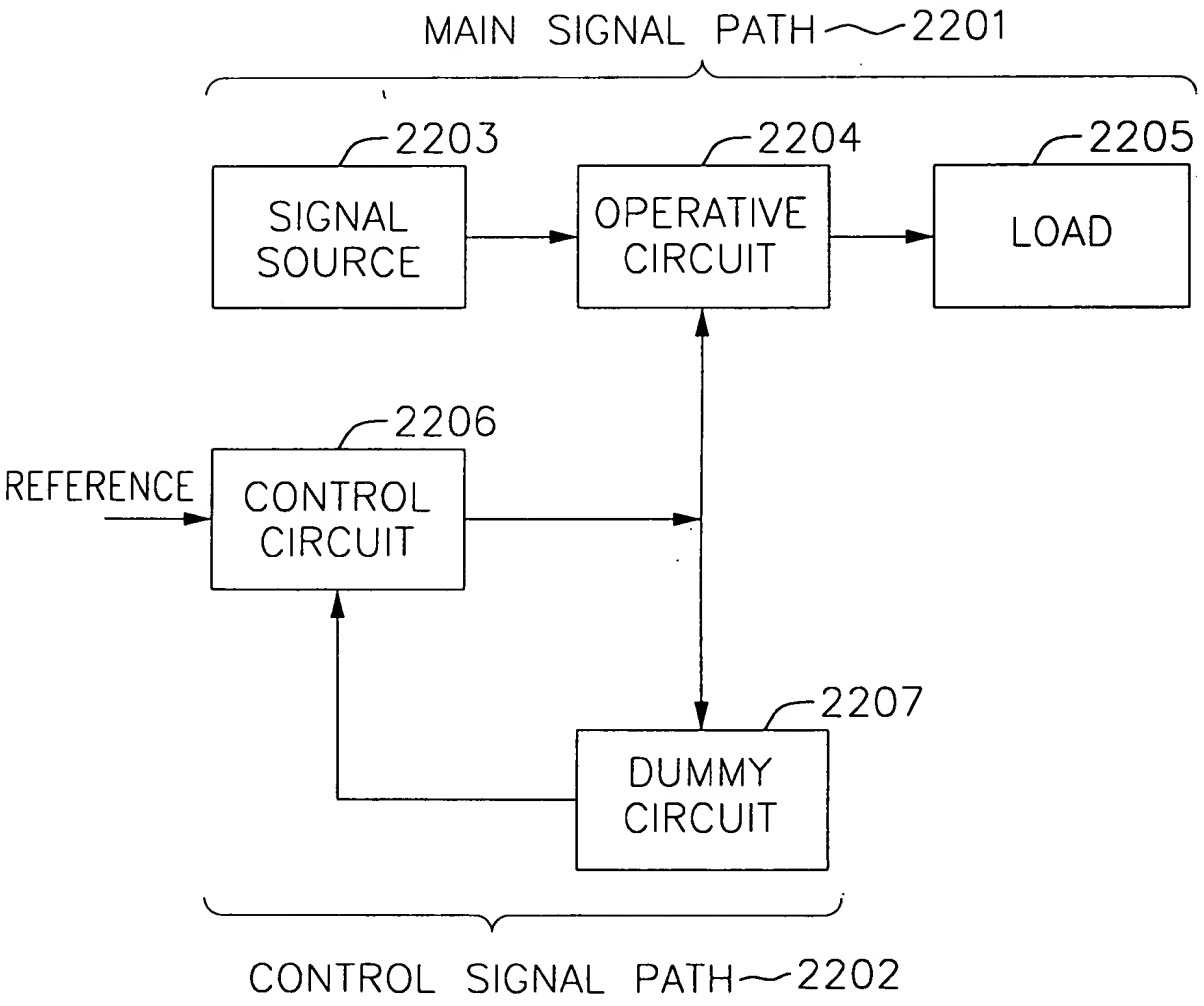
36MHz IF

TABLE OF FREQUENCIES BASED ON COARSE/FINE PLL SOLUTION:

NOTE
- LO-2 REF=100KHz
  SO DIVIDE RANGE=9280 TO 9340

Frf (MHz)	50	58	66	74	82	90	98	106	114	122	130	138	146	154	"	852	860
LO-1 (MHz)	1250	1260	1270	1270	1280	1290	1300	1310	1310	1320	1330	1340	1350	1350	"	2050	2060
IF-1 (MHz)	1200	1202	1204	1196	1198	1200	1202	1204	1196	1198	1200	1202	1204	1196	"	1198	1200
LO-2 (MHz)	931.2	932.8	934.4	928.0	930	931	933	934	928.0	930	931	933	934	928.0	"	929.60	931.2
IF-2 (MHz)	268.8	269.2	269.6	268.0	268.4	268.8	269.2	269.6	268.0	268.4	268.8	269.2	269.6	268.0	"	268.4	268.8
LO-3 (MHz)	232.8	233.2	233.6	232	232	233	233	234	232	232	233	233	234	232.0	"	232.4	232.8
IF-3 (MHz)	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	"	36.0	36.0

FIG.23


MAIN SIGNAL PATH
2201
2203
2204
2205
SIGNAL SOURCE
OPERATIVE CIRCUIT
LOAD
2206
REFERENCE
CONTROL CIRCUIT
2207
DUMMY CIRCUIT
CONTROL SIGNAL PATH
2202

09521 0702200

FIG.24a

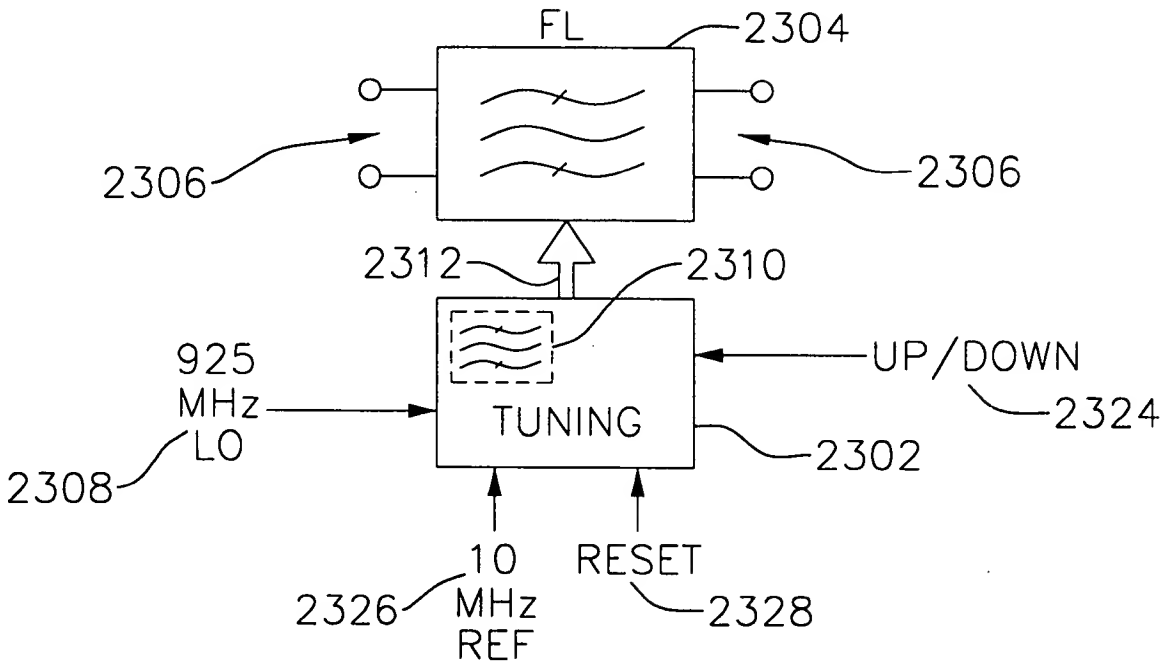
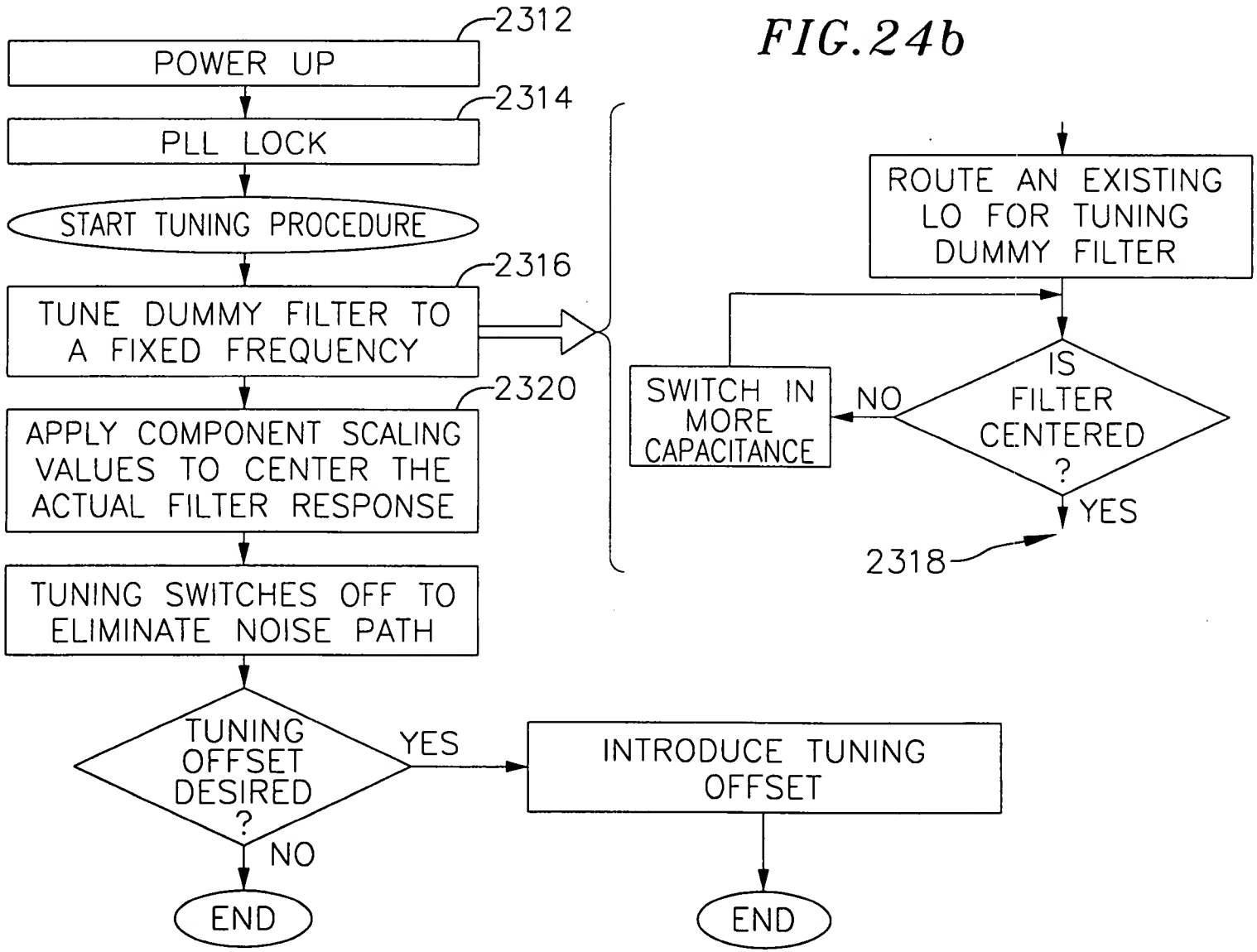


FIG. 24b


2312
POWER UP
2314
PLL LOCK
START TUNING PROCEDURE
2316
TUNE DUMMY FILTER TO A FIXED FREQUENCY
2320
APPLY COMPONENT SCALING VALUES TO CENTER THE ACTUAL FILTER RESPONSE
TUNING SWITCHES OFF TO ELIMINATE NOISE PATH
TUNING OFFSET DESIRED ?
YES
NO
END
INTRODUCE TUNING OFFSET
END
ROUTE AN EXISTING LO FOR TUNING DUMMY FILTER
IS FILTER CENTERED ?
NO
SWITCH IN MORE CAPACITANCE
YES
2318

DOCKET ONE2200

FIG.24c

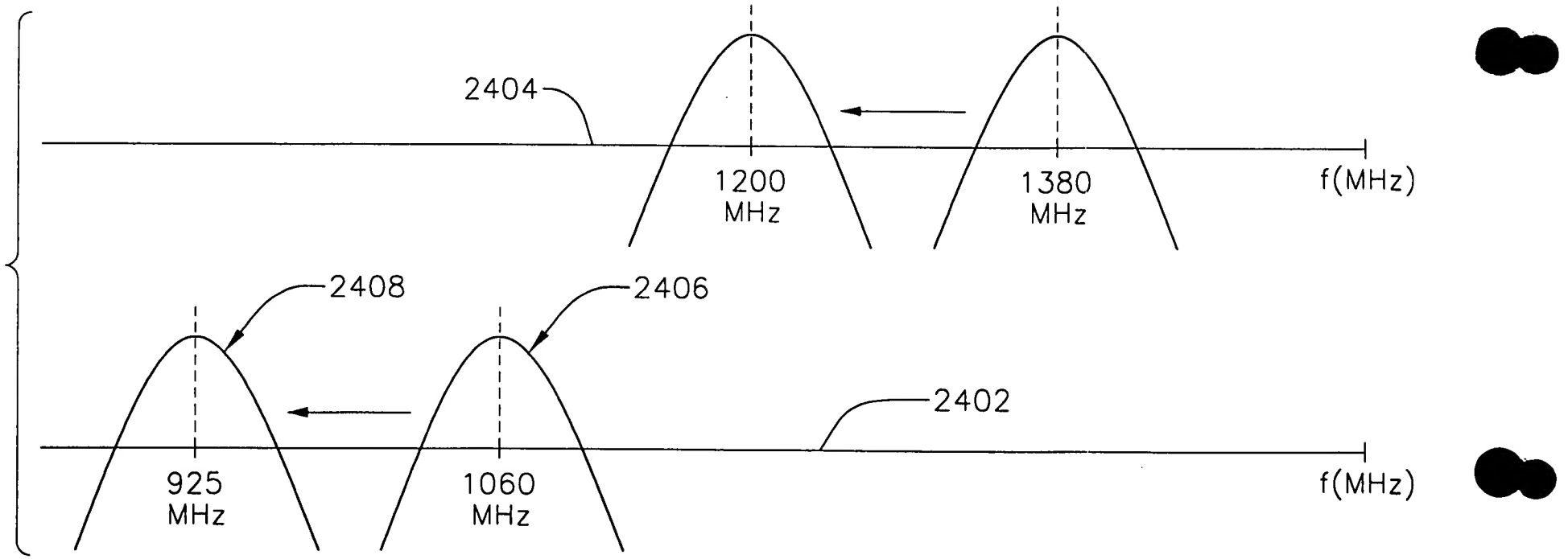


FIG.25

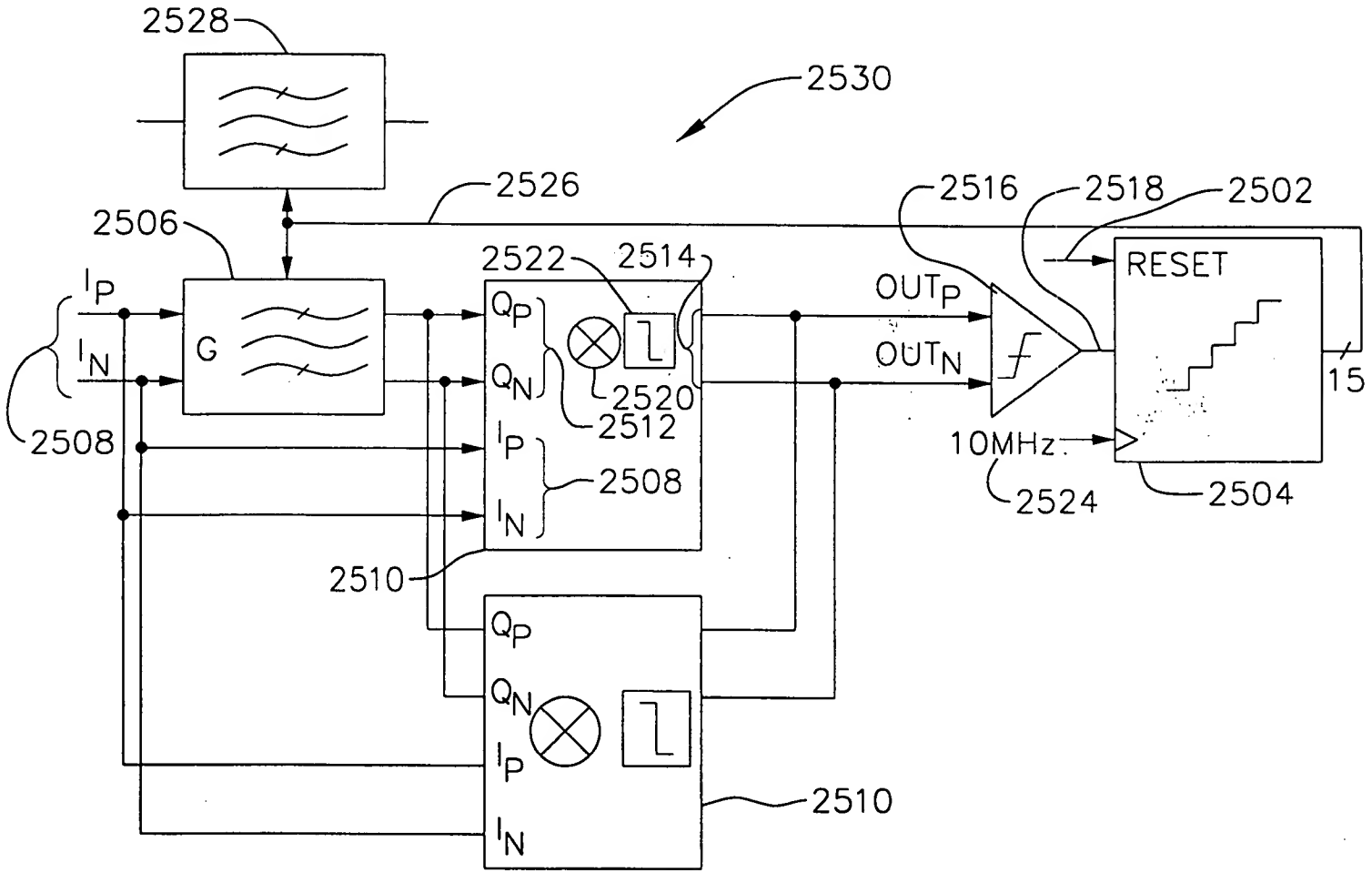
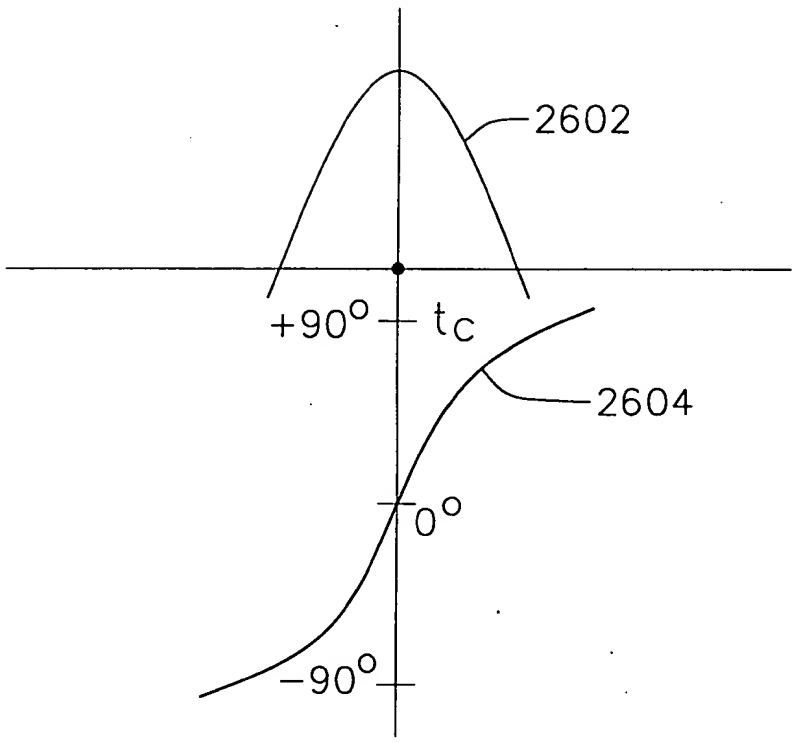

2528
2530
2526
2516
2518
2502
2506
2522
2514
RESET
I_P
I_N
G
Q_P
Q_N
OUT_P
OUT_N
15
2520
2512
2508
I_P
I_N
2508
10MHz
2524
2504
2510
Q_P
Q_N
I_P
I_N
2510

FIG.26



DOCKET ARTSCAN

FIG.27

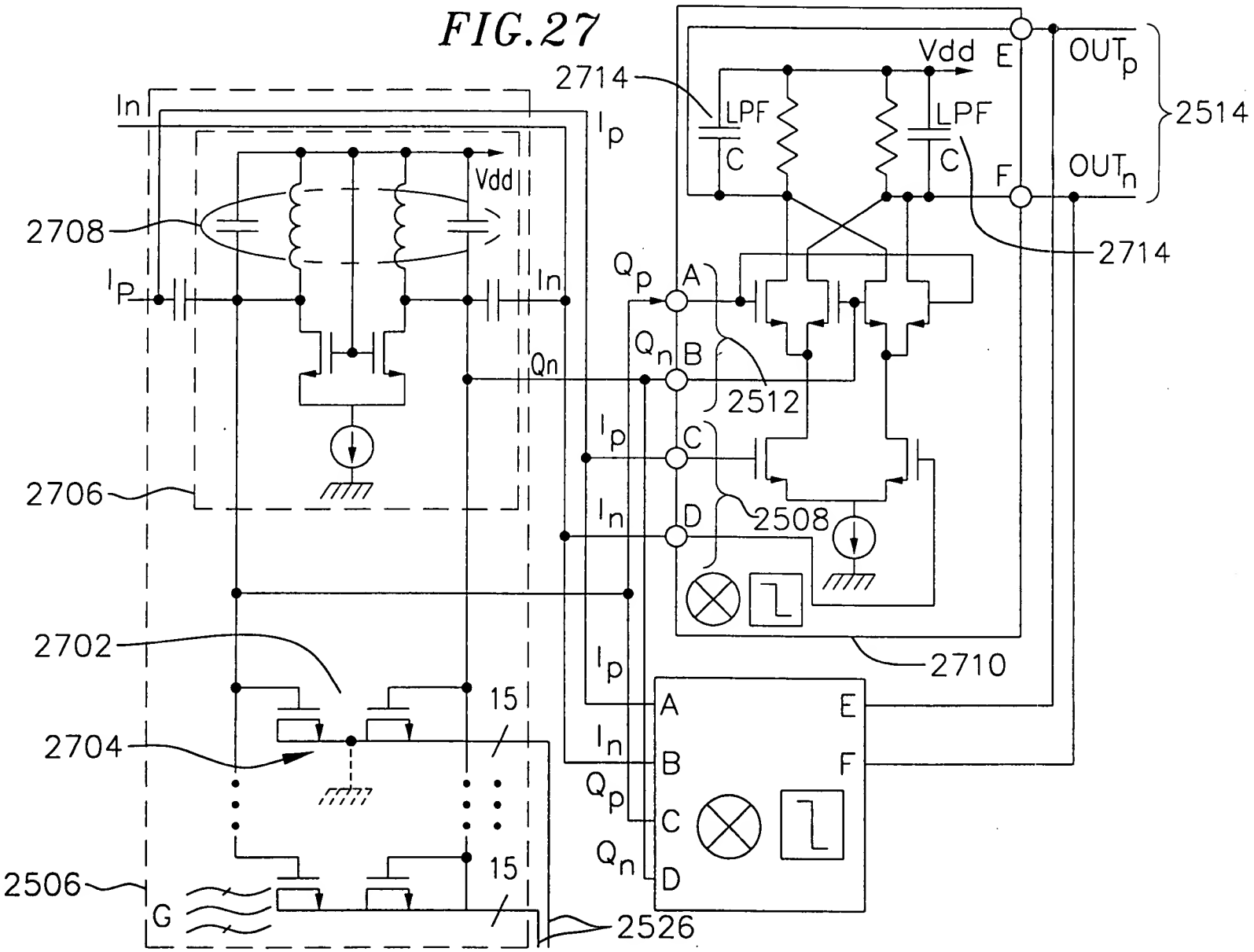


FIG.28a

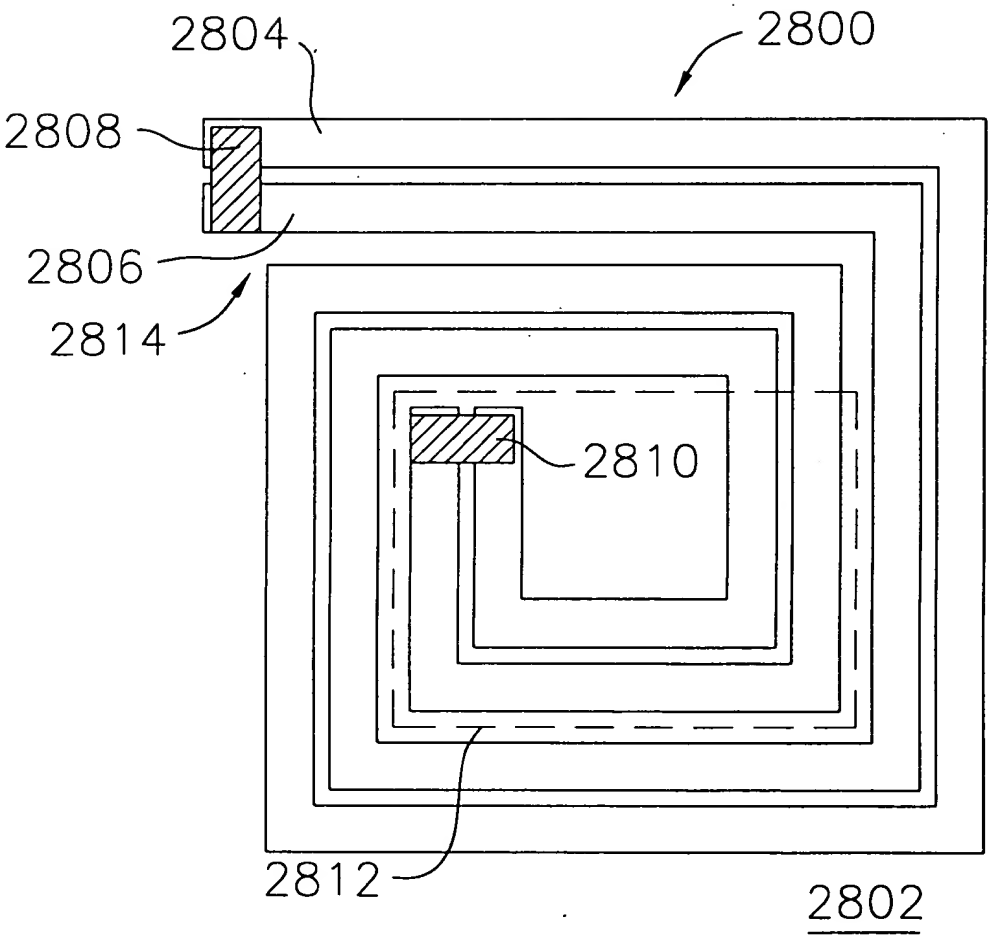


FIG.28b

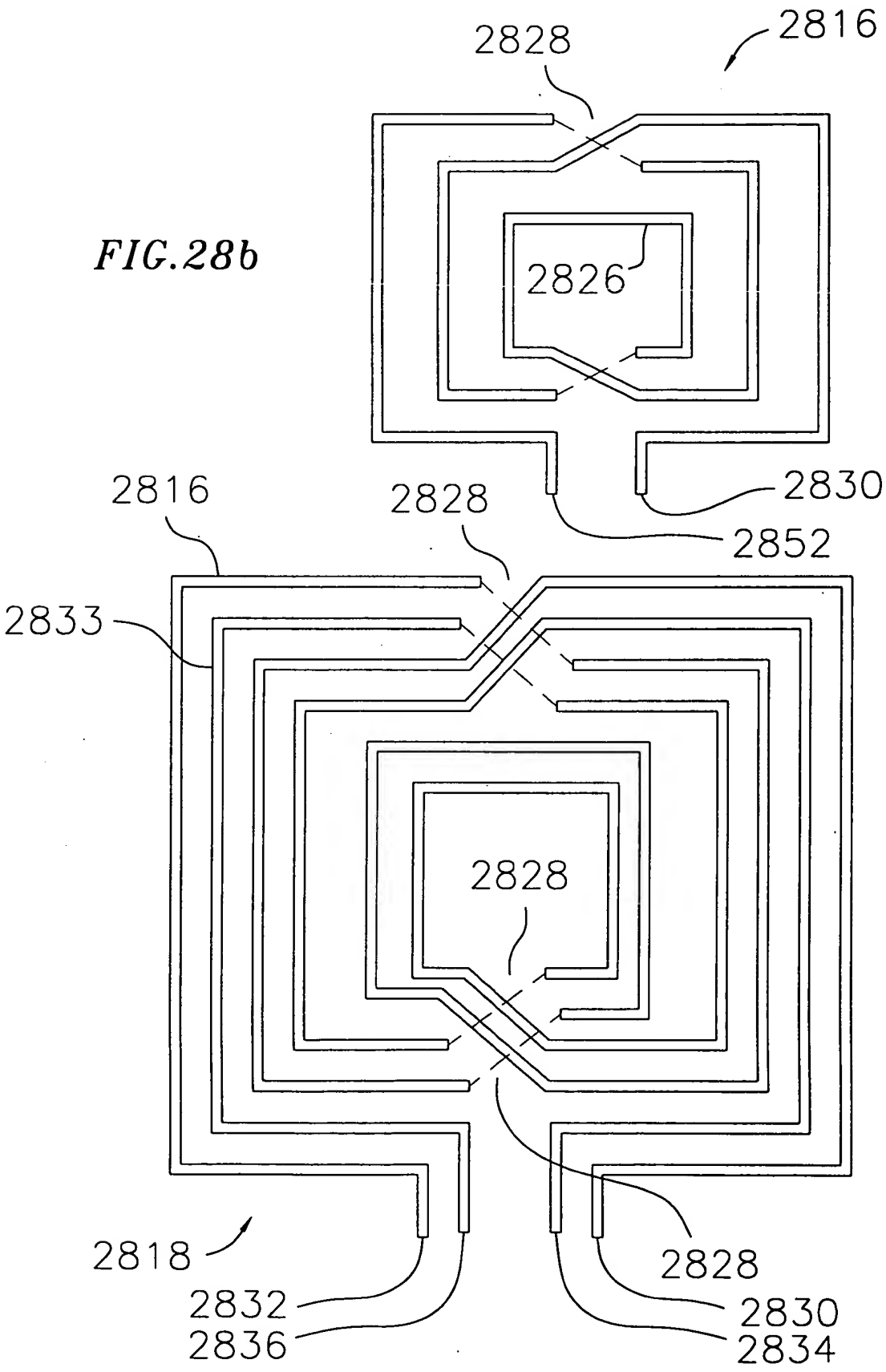
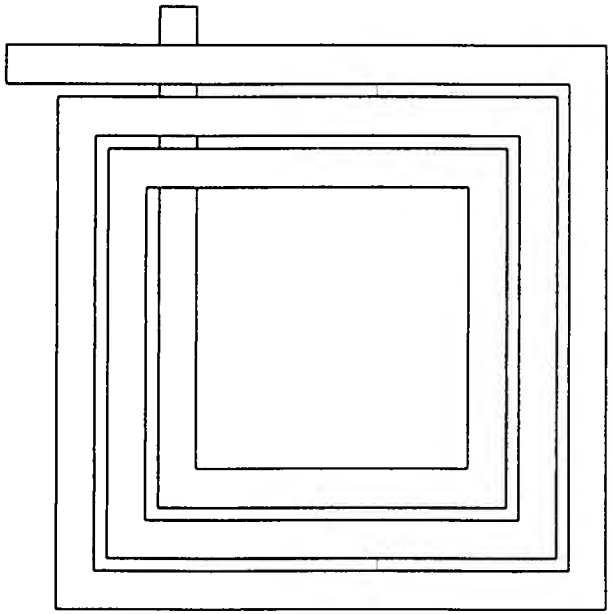
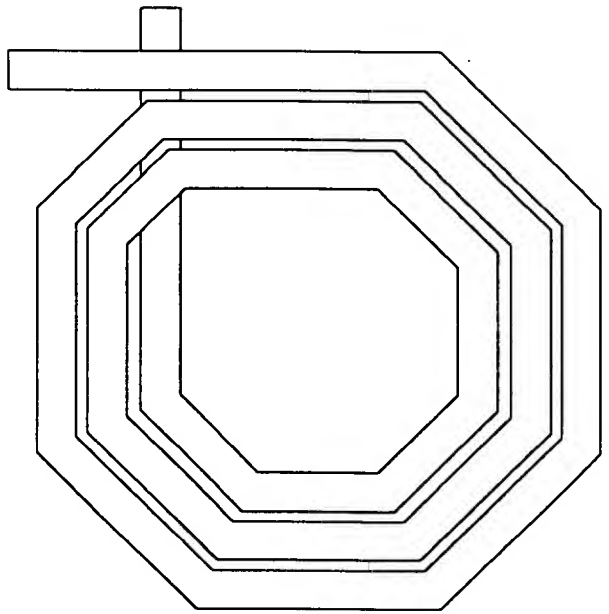

2828
2816
2826
2830
2816
2828
2852
2833
2828
2818
2828
2832
2830
2836
2834

FIG.28c



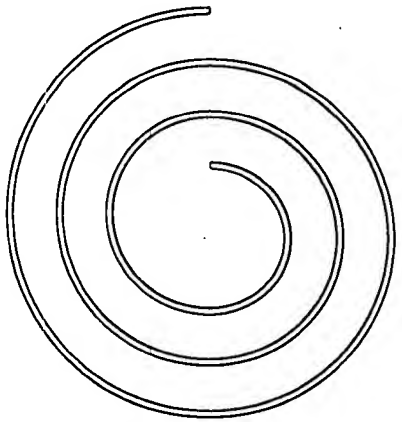
2820

FIG.28d



2822

FIG.28e



2824

FIG.28f

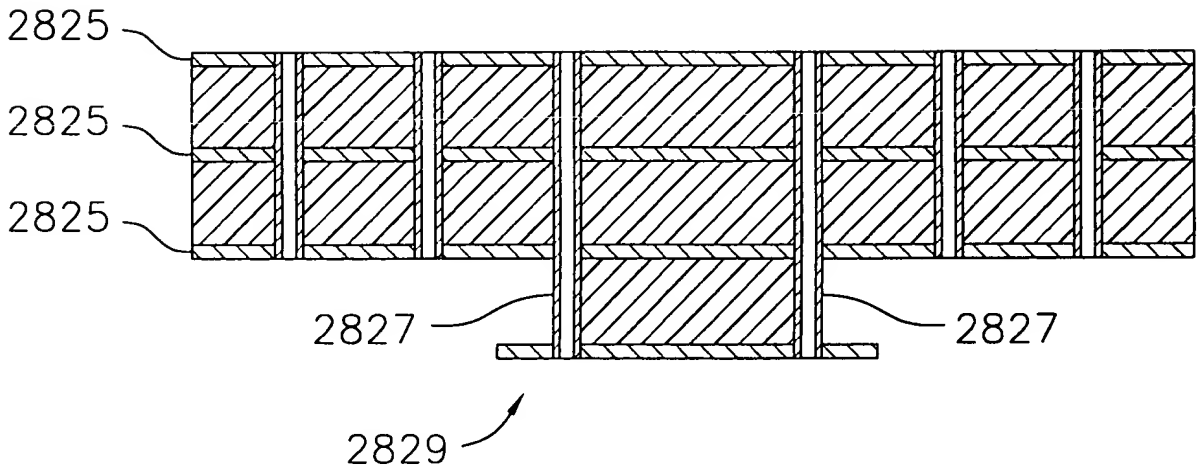
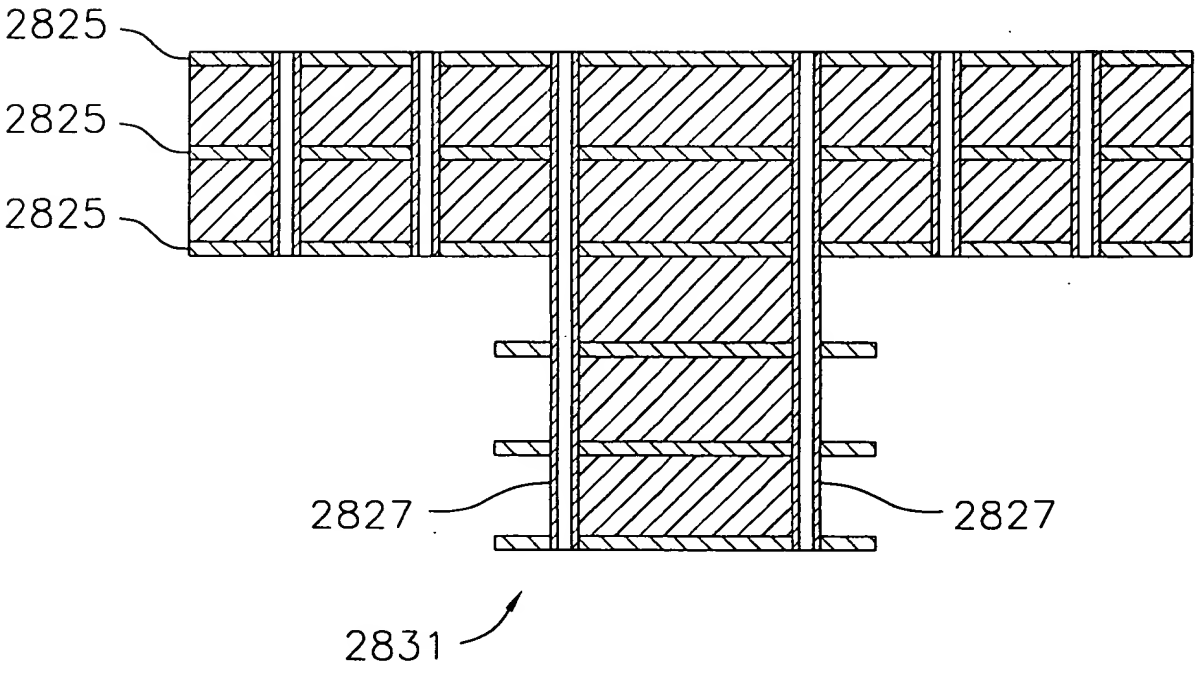


FIG.28g



0037E 6162260

FIG.28i

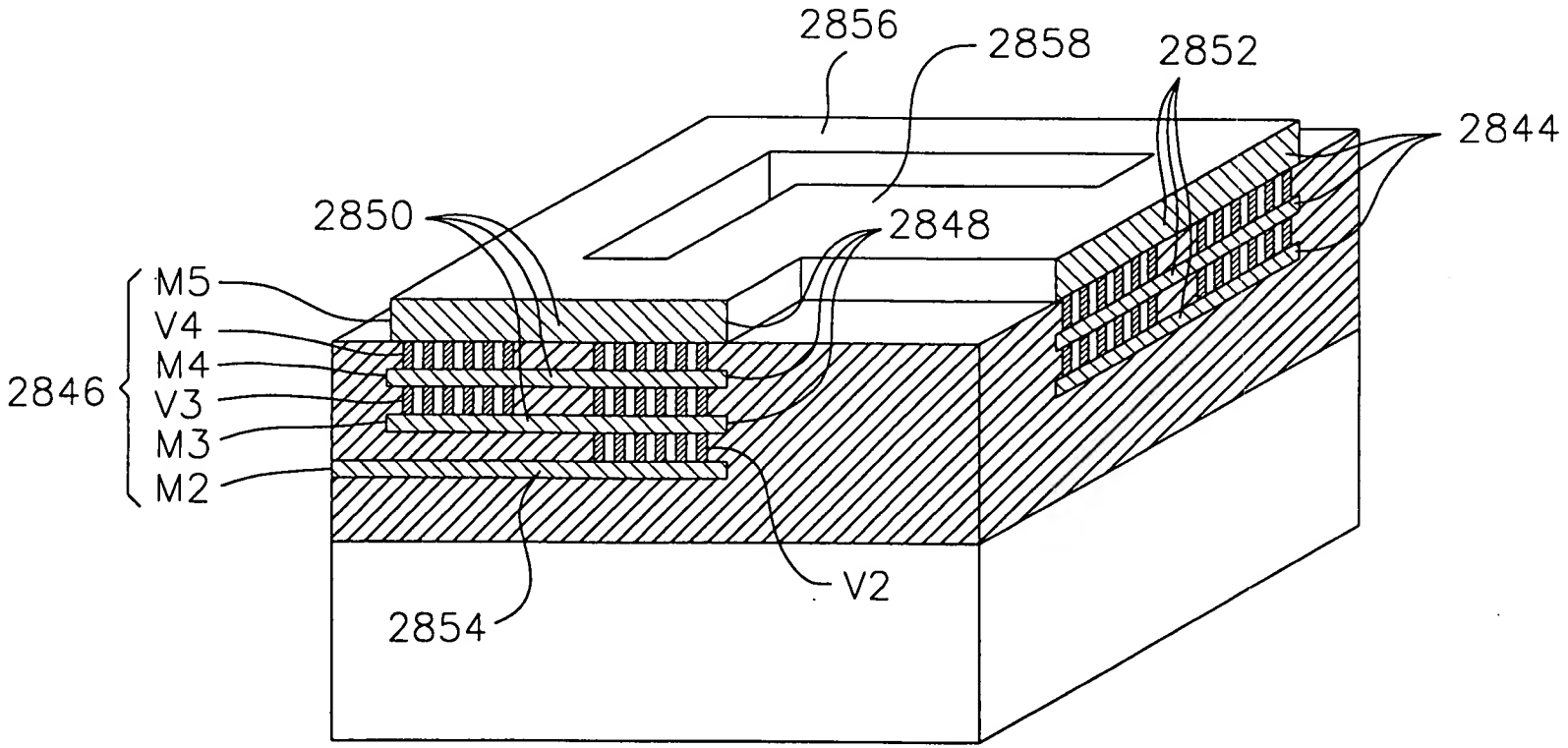
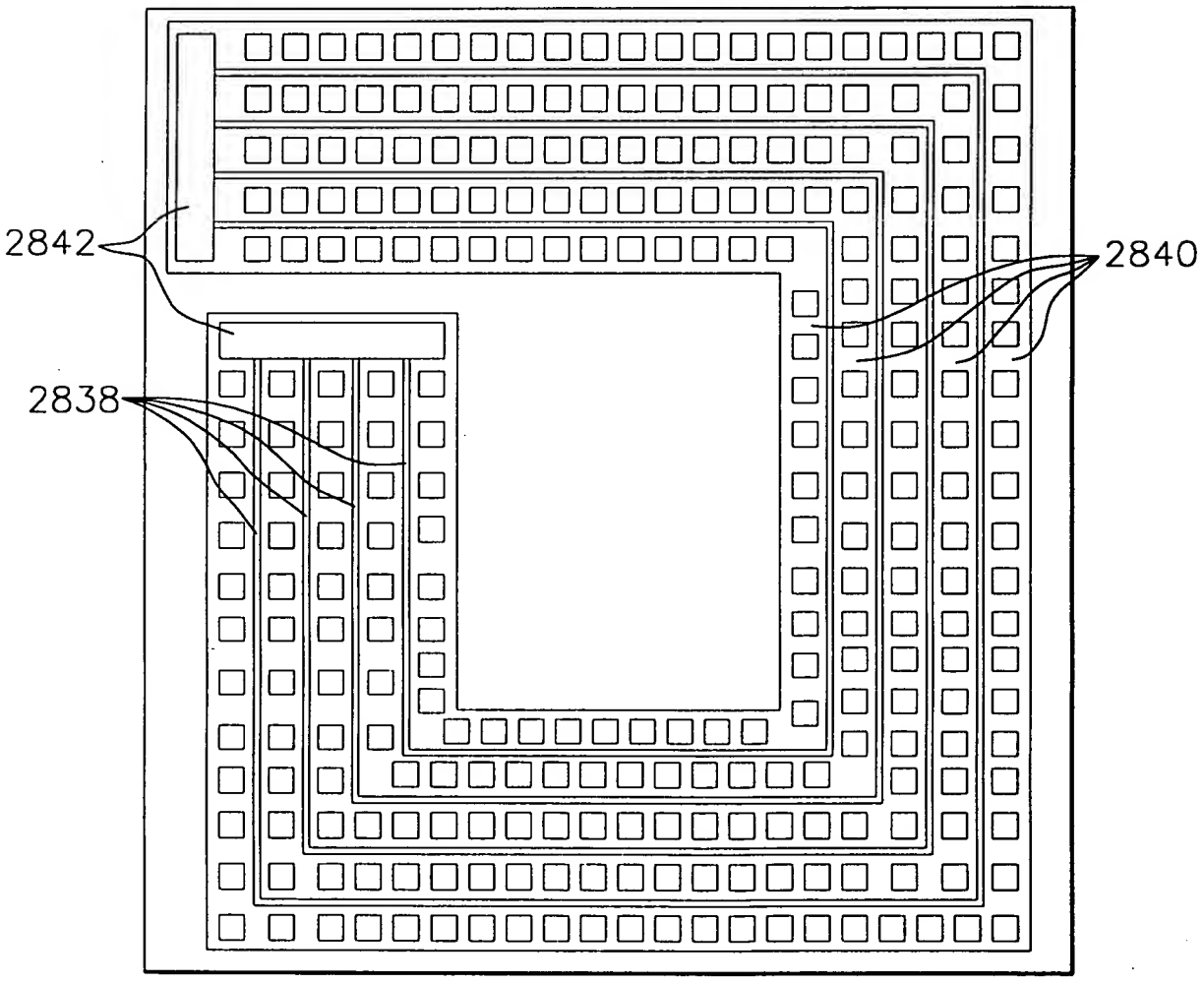


FIG.28h



0057E-0702Z0

FIG.28j

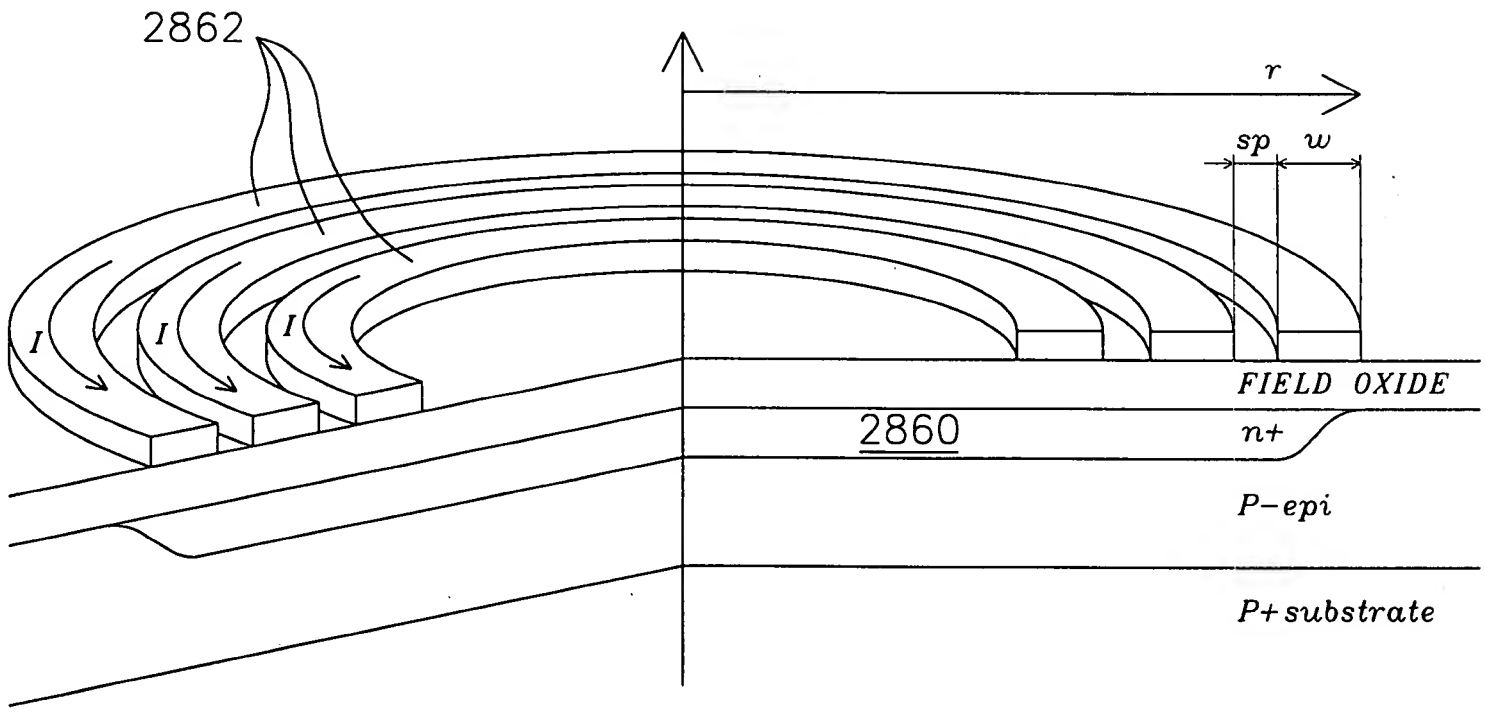


FIG.28k

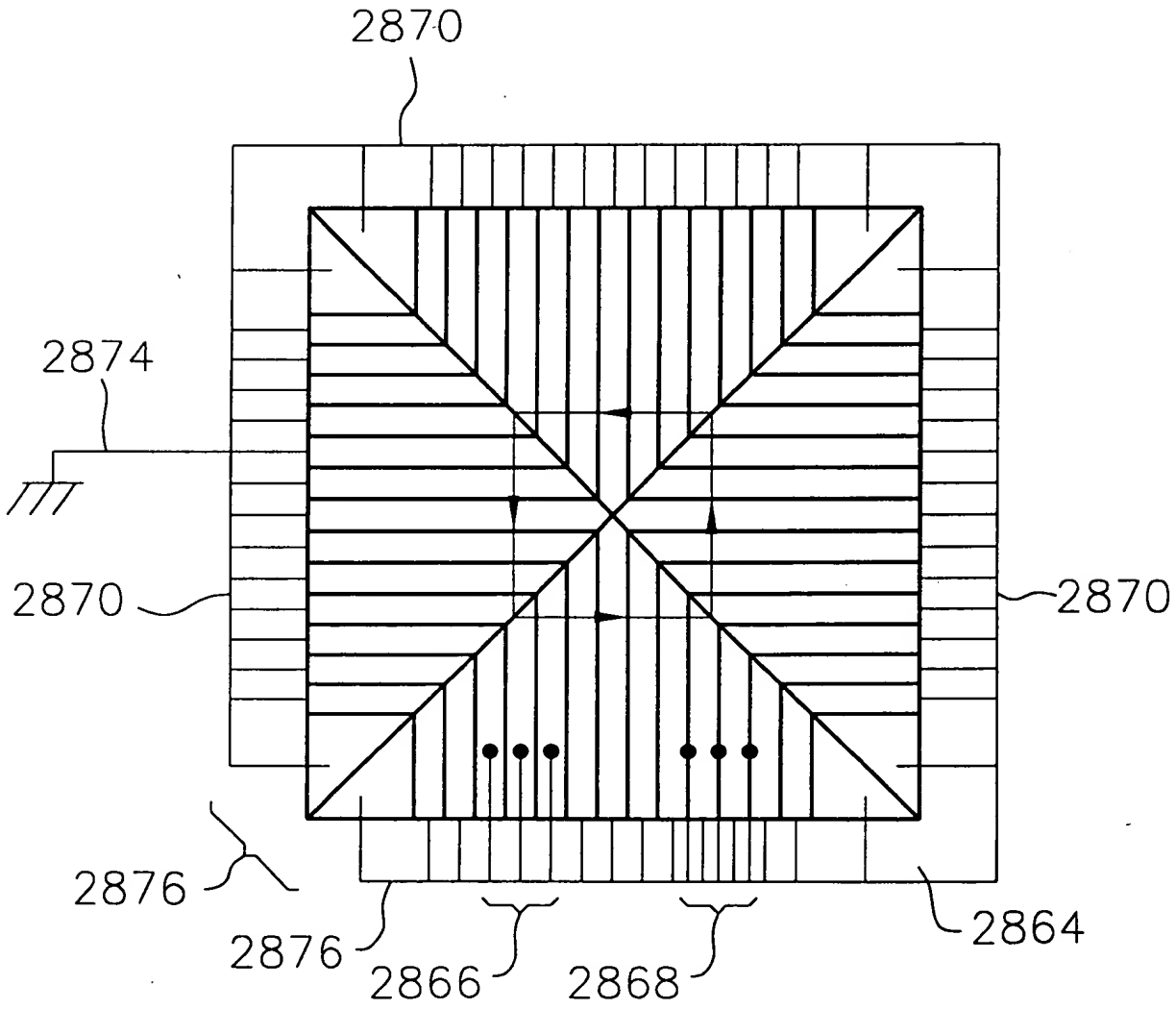


FIG.29

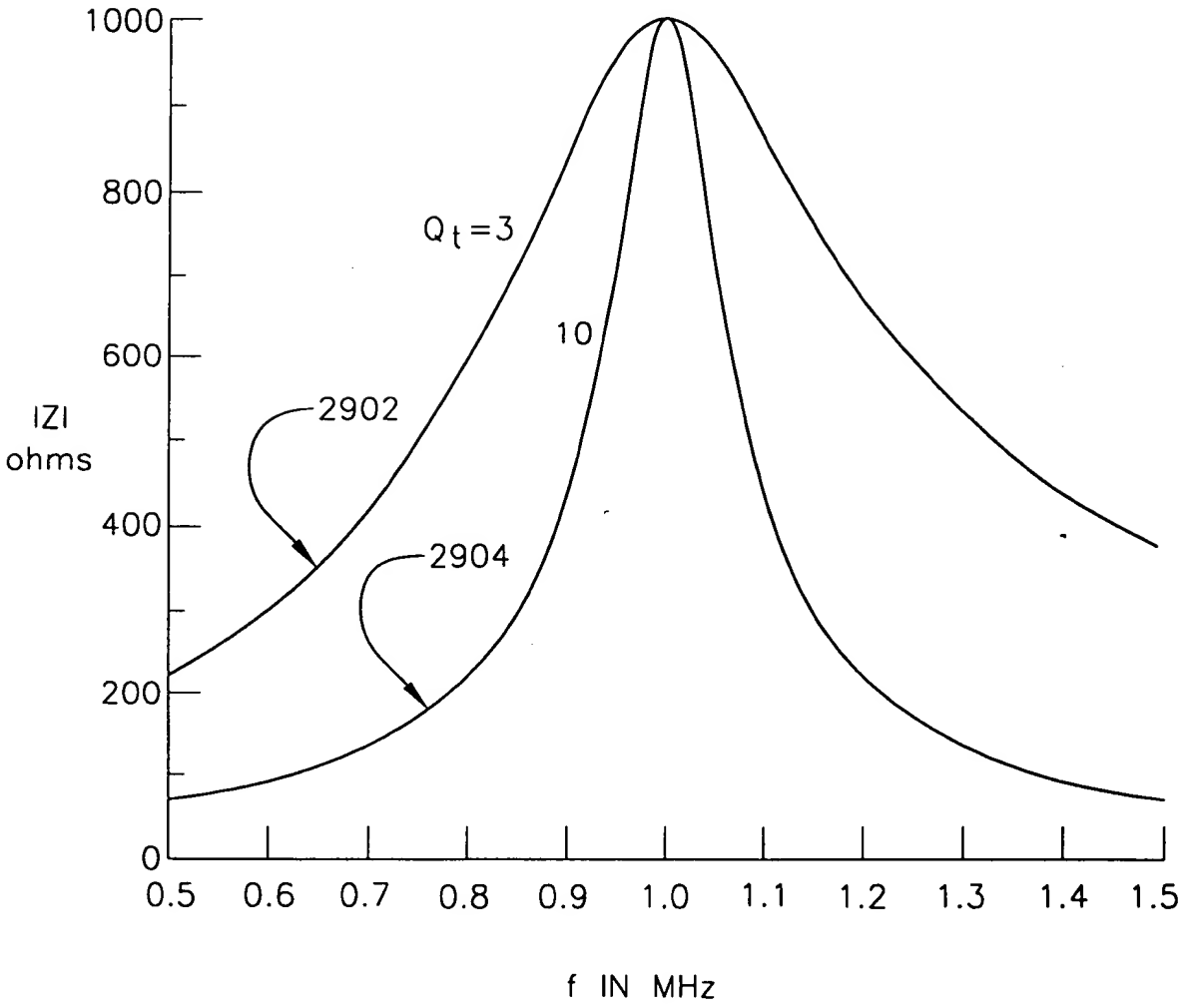

1000
800
600
400
200
0
IZI
ohms
$Q_t = 3$
10
2902
2904
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
f IN MHz

FIG.30

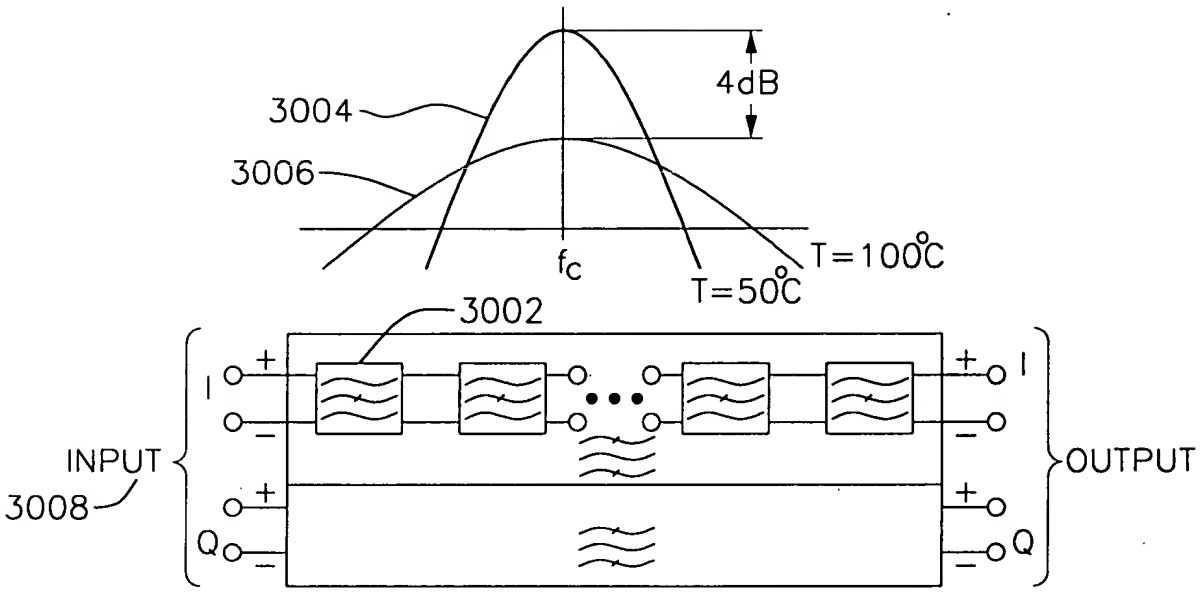
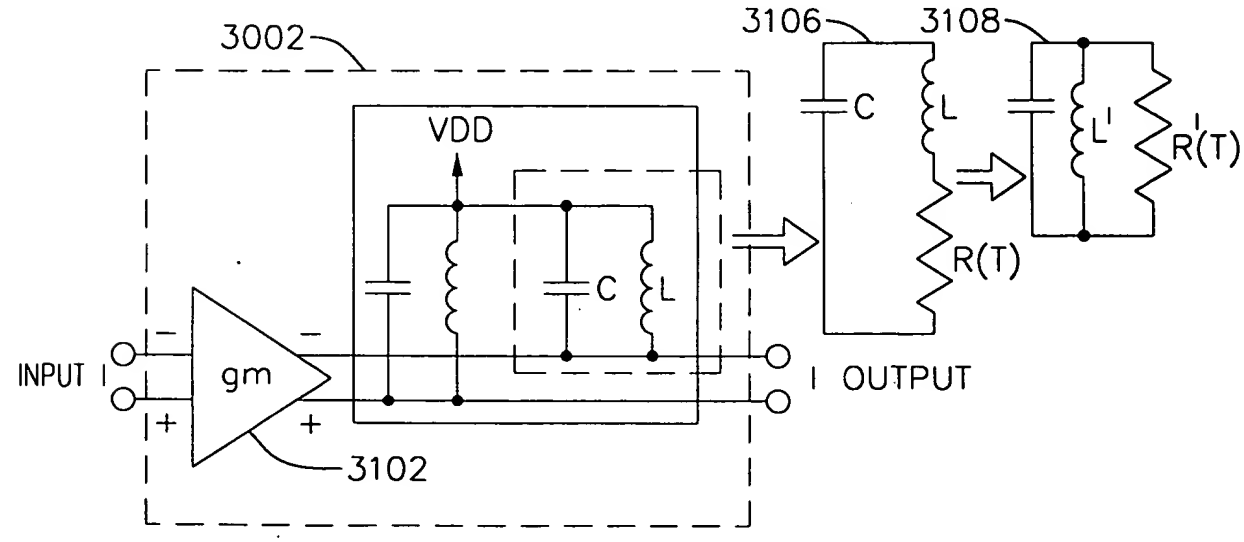
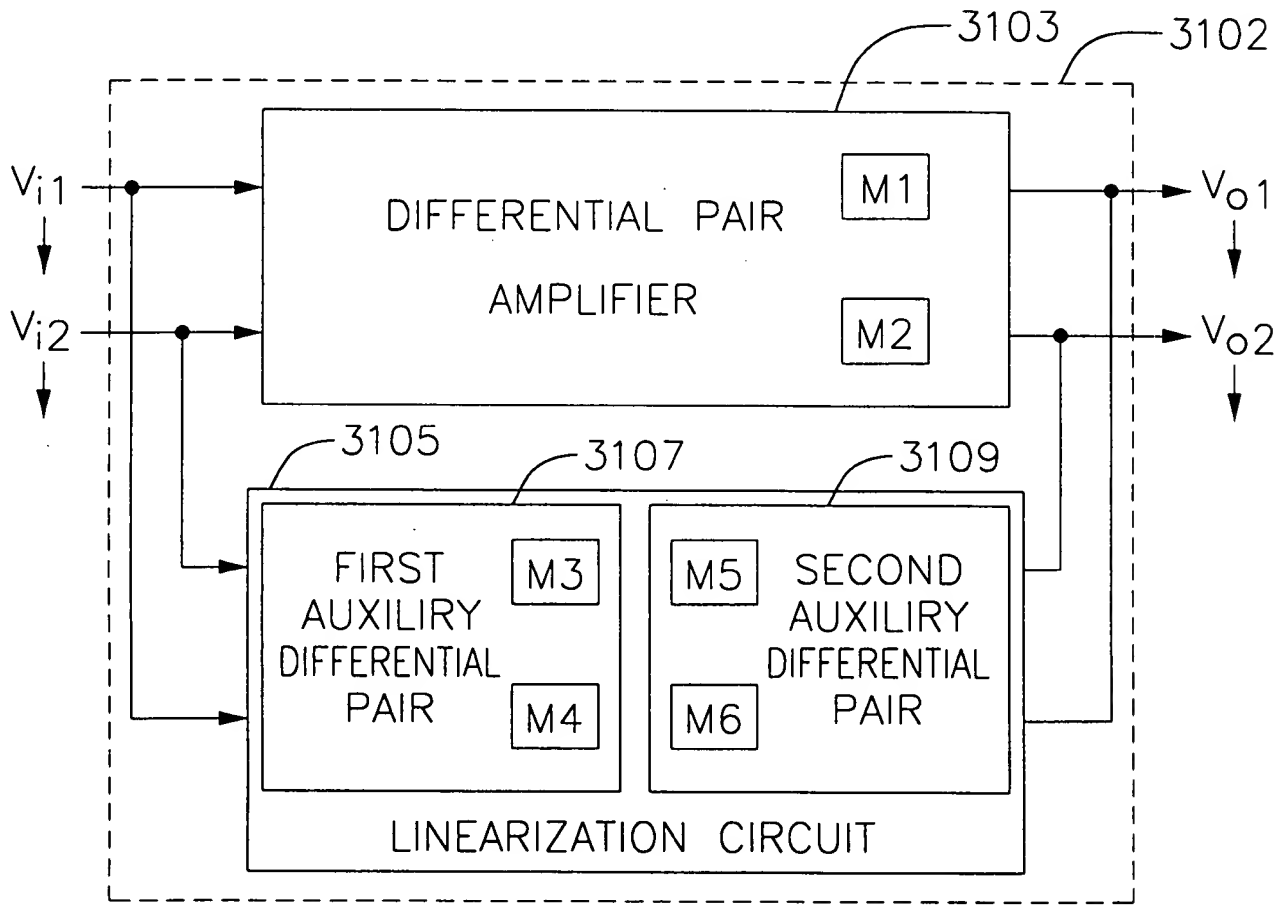


FIG.31a



Docket: 0120200

FIG.31b



DOCKET ORIGINAL

FIG.31c

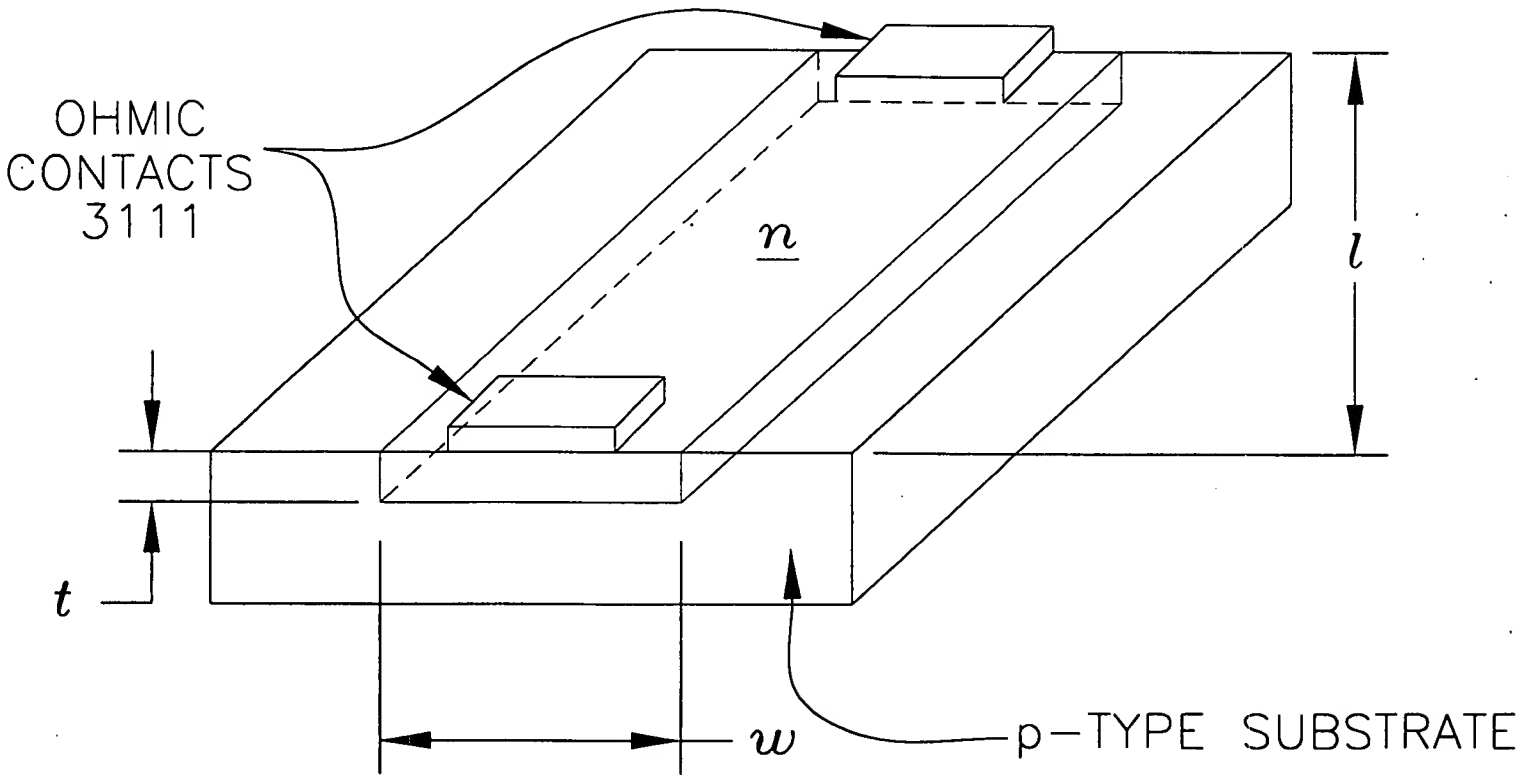


FIG.31d

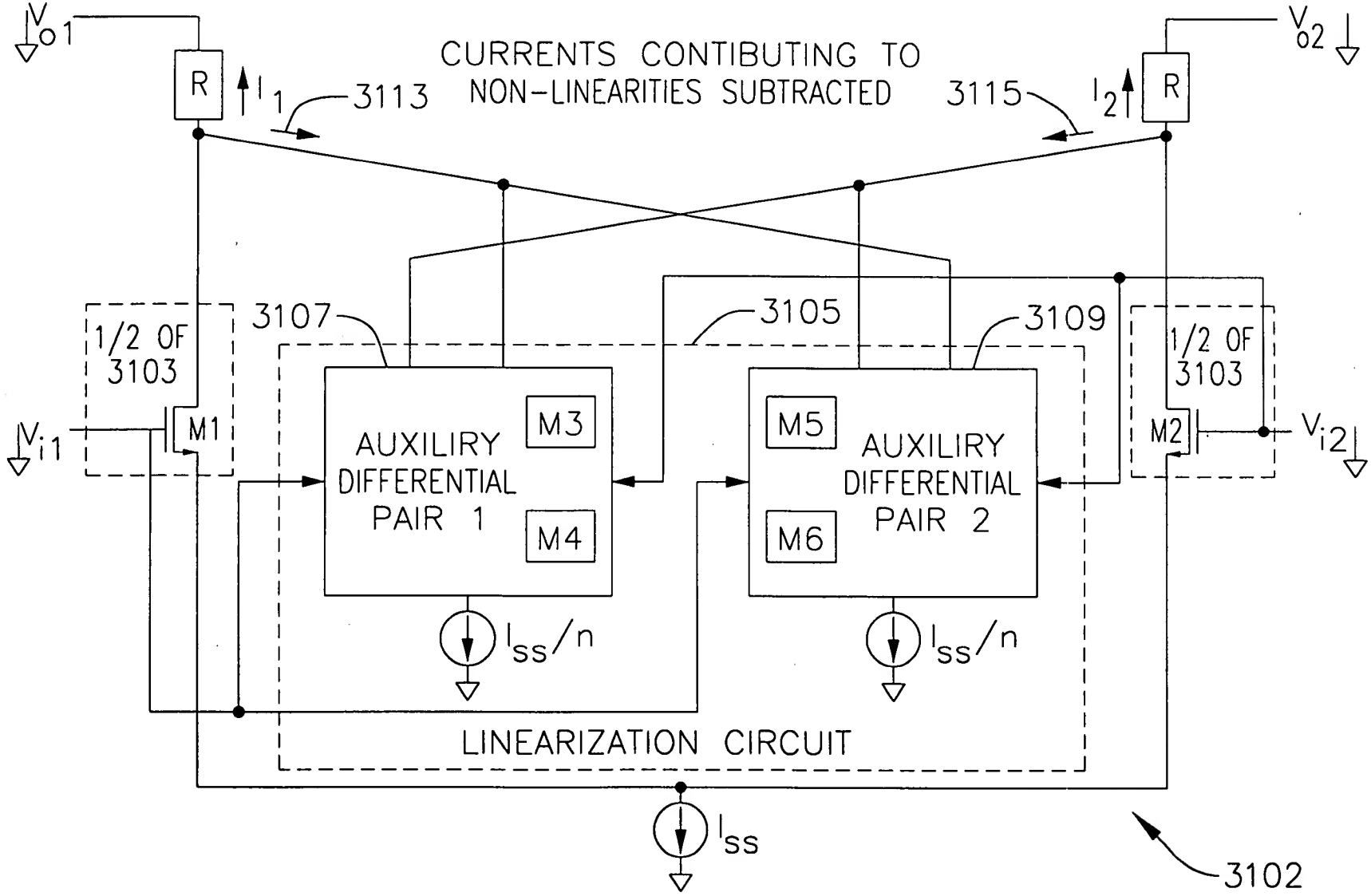
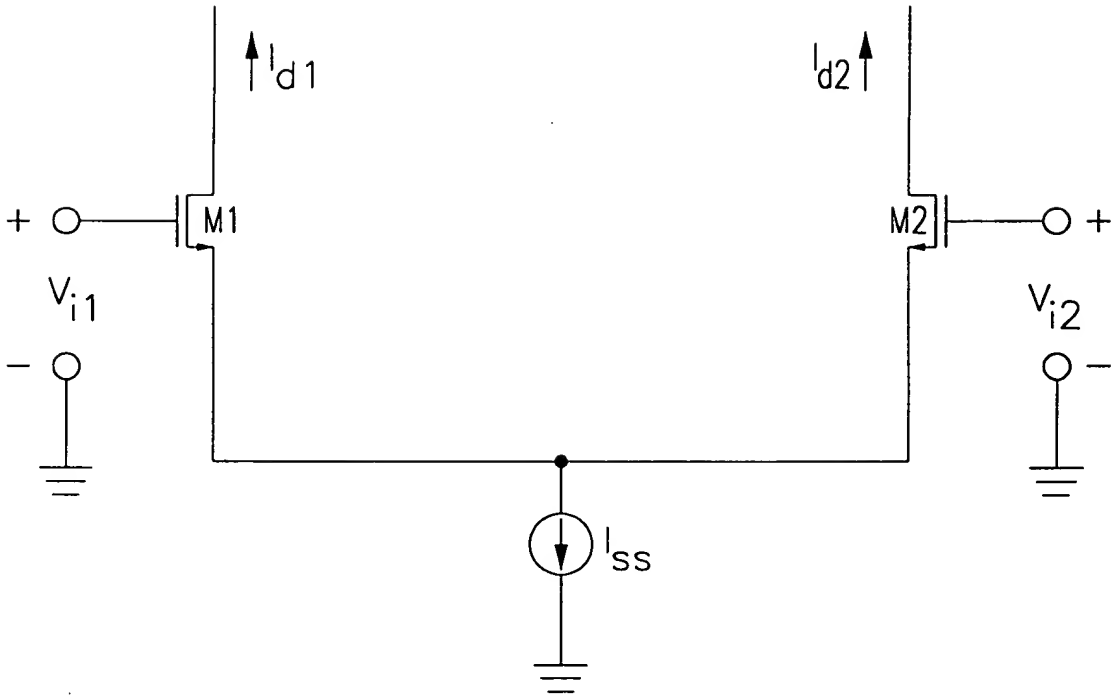

V_{o1}
V_{o2}
R
R
I_1
I_2
3113
3115
CURRENTS CONTIBUTING TO NON-LINEARITIES SUBTRACTED
1/2 OF 3103
1/2 OF 3103
3107
3105
3109
V_{i1}
V_{i2}
M1
M2
M3
M4
M5
M6
AUXILIRY DIFFERENTIAL PAIR 1
AUXILIRY DIFFERENTIAL PAIR 2
I_{ss}/n
I_{ss}/n
LINEARIZATION CIRCUIT
I_{ss}
3102

FIG.31e



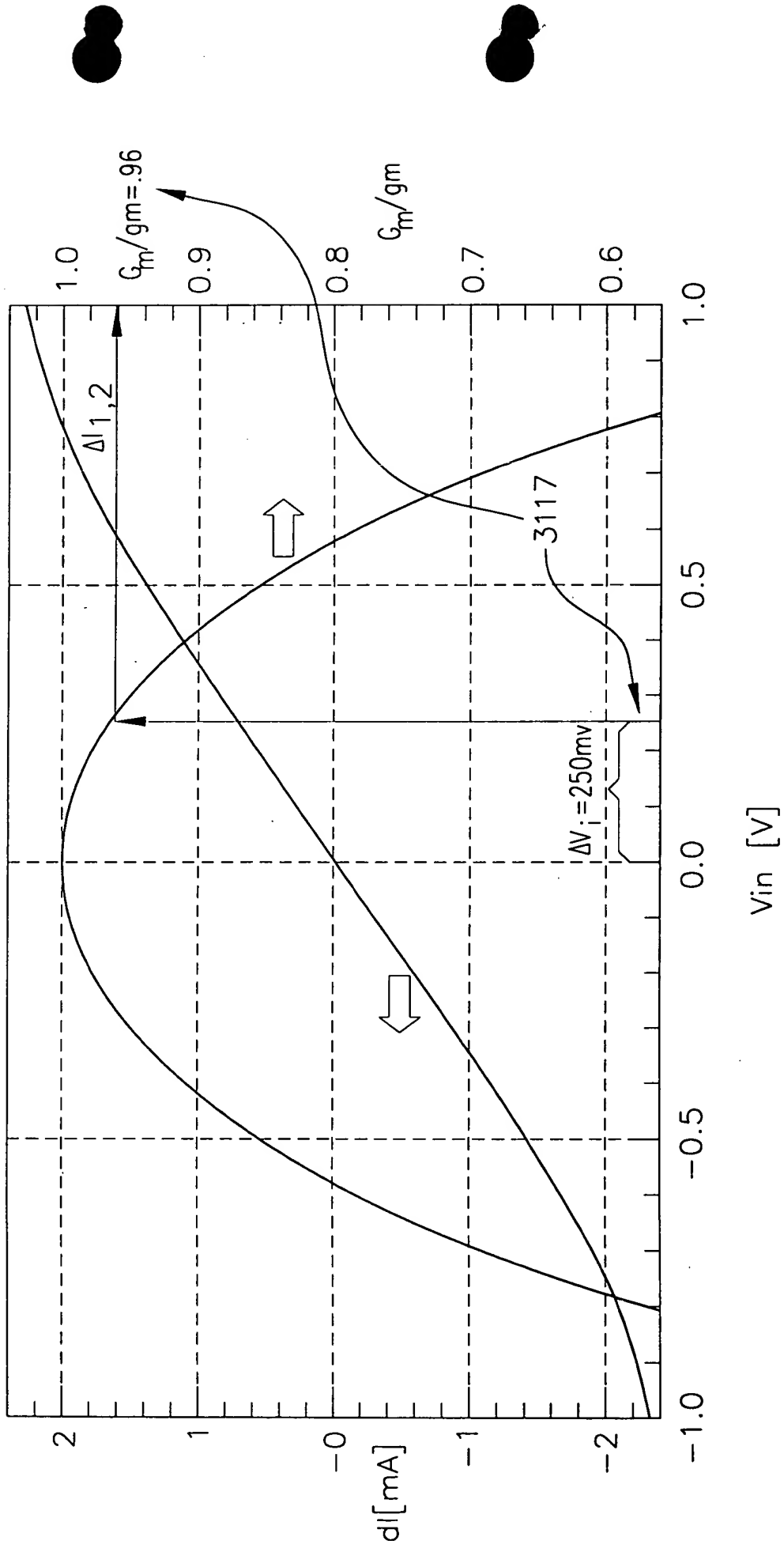
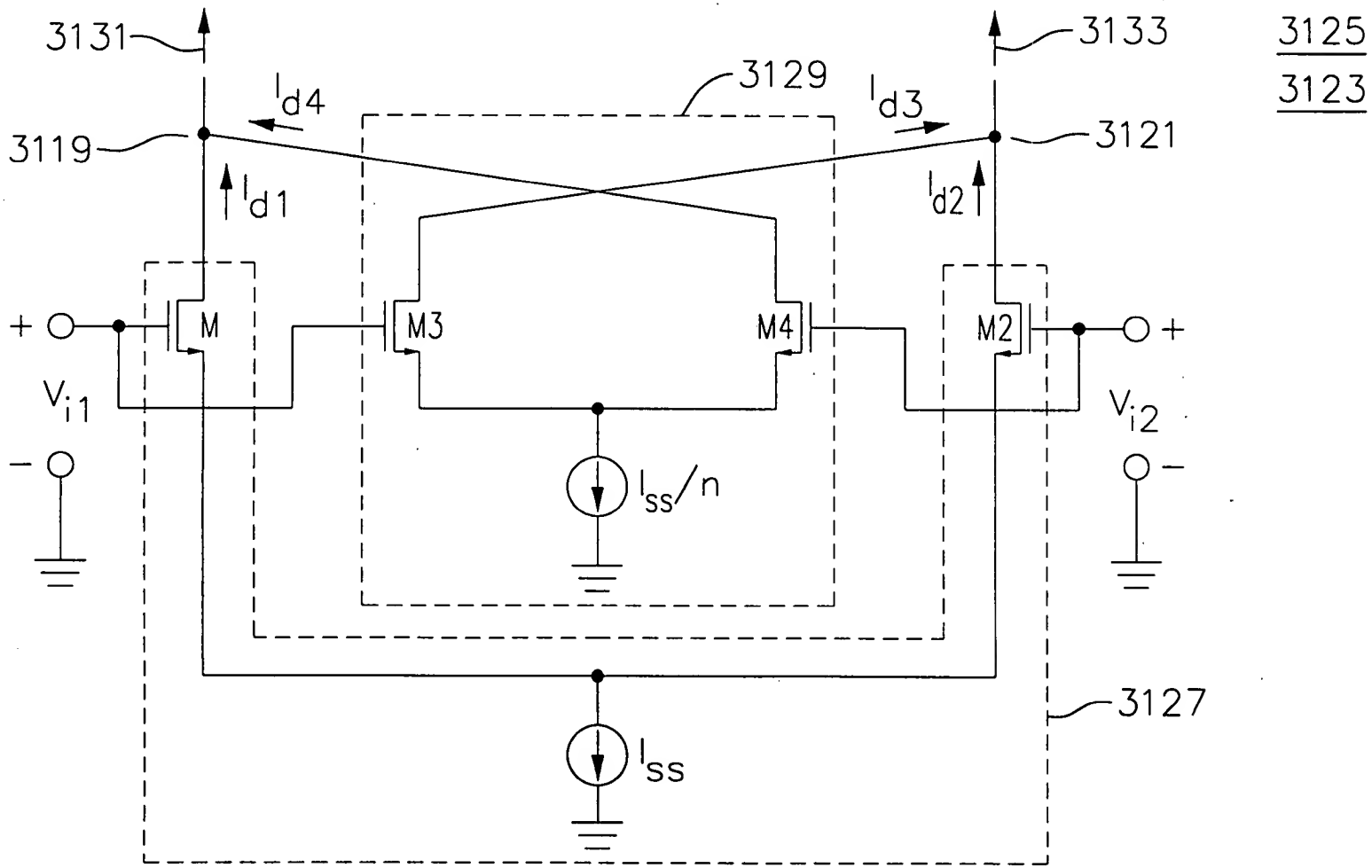

1.0
0.9
0.8
0.7
0.6
Gm/gm
Gm/gm=.96
ΔI1,2
3117
ΔVi=250mv
2
1
−0
−1
−2
dI[mA]
−1.0
−0.5
0.0
0.5
1.0
Vin [V]

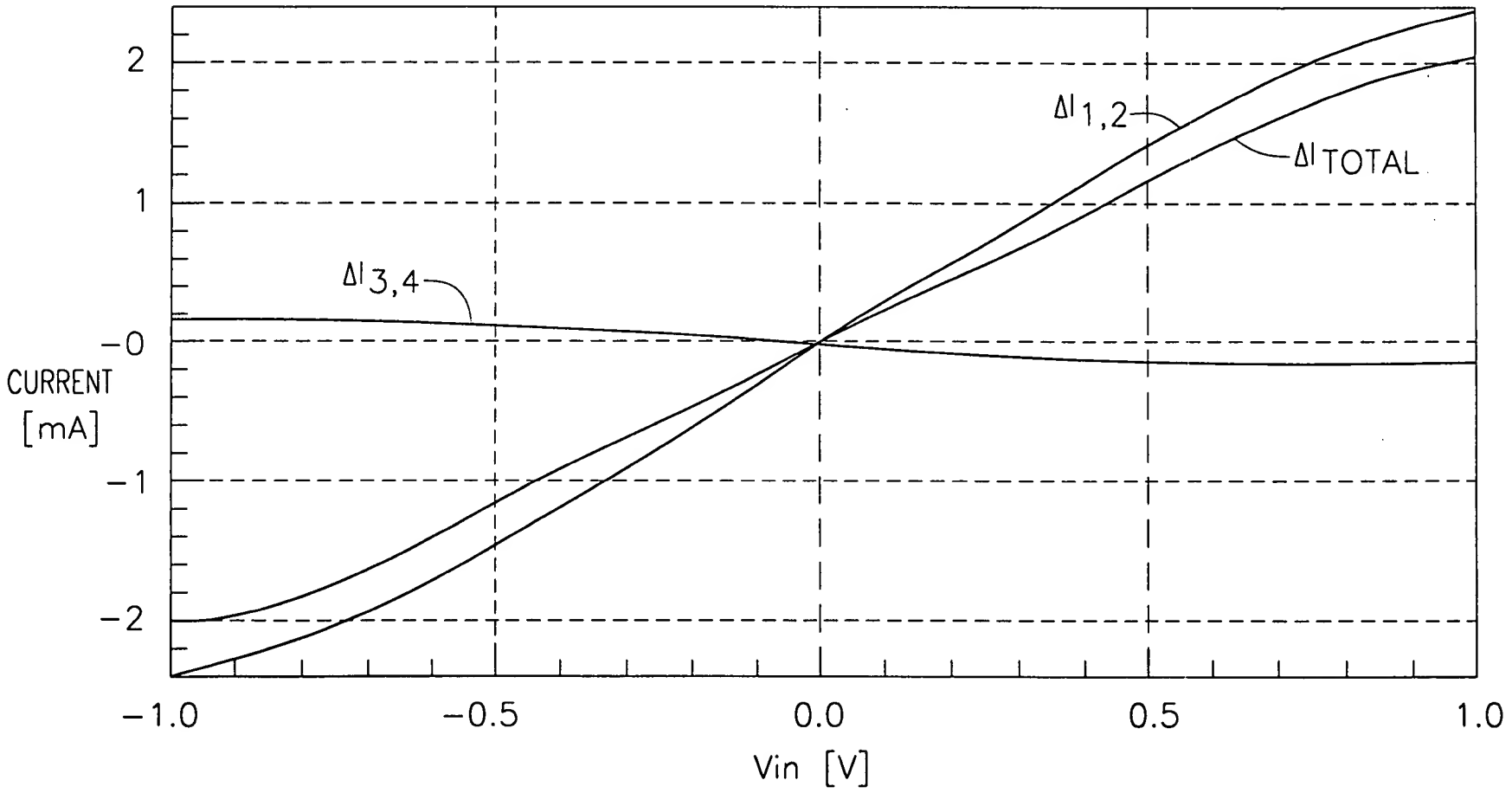
FIG.31f

FIG.31g


3131
3133
3125
3123
3129
I_{d4}
I_{d3}
3119
3121
I_{d1}
I_{d2}
+
M
M3
M4
M2
+
V_{i1}
V_{i2}
−
I_{ss}/n
−
3127
I_{ss}

UNITED STATES PATENT

FIG.31h



0057ET 0126260

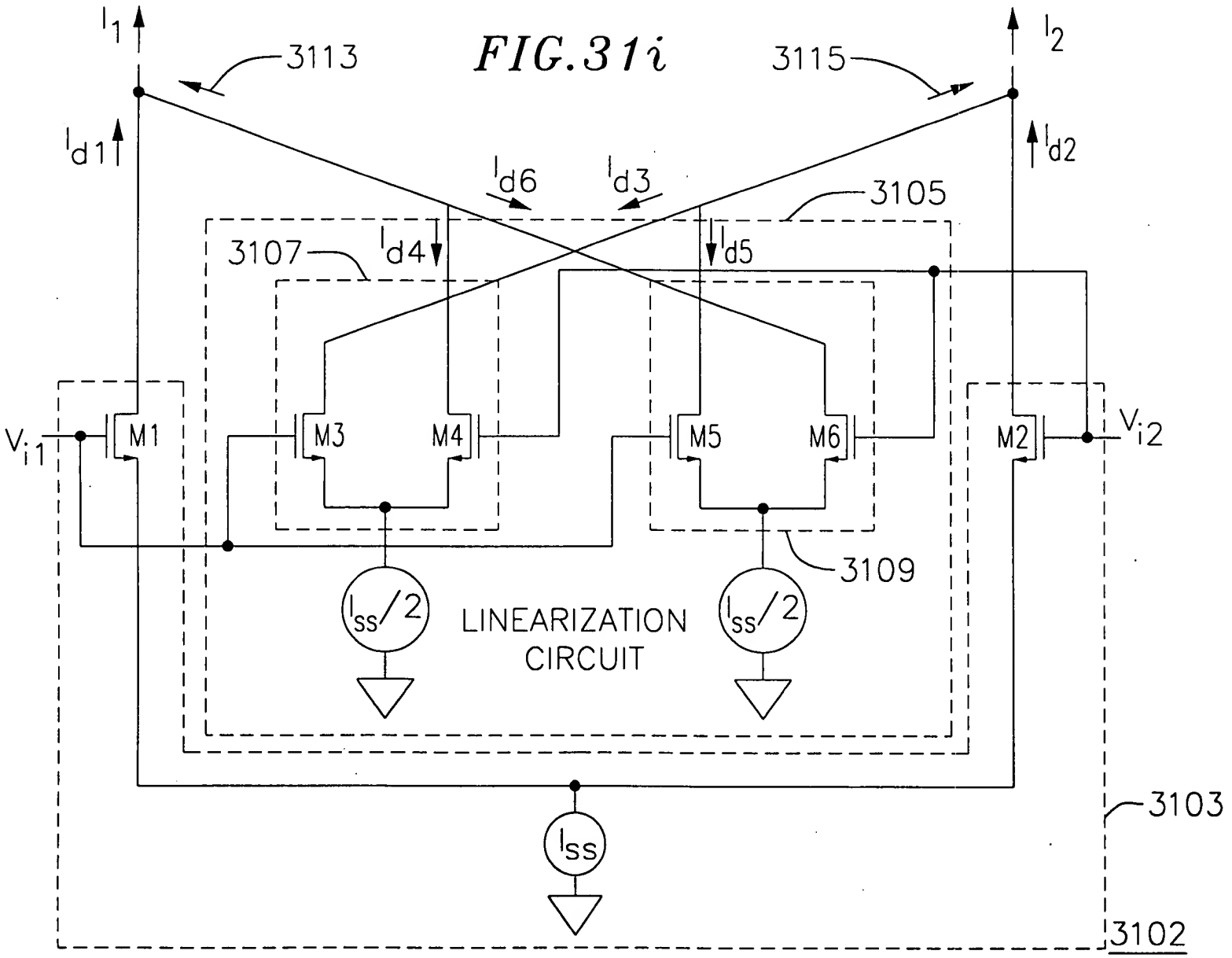
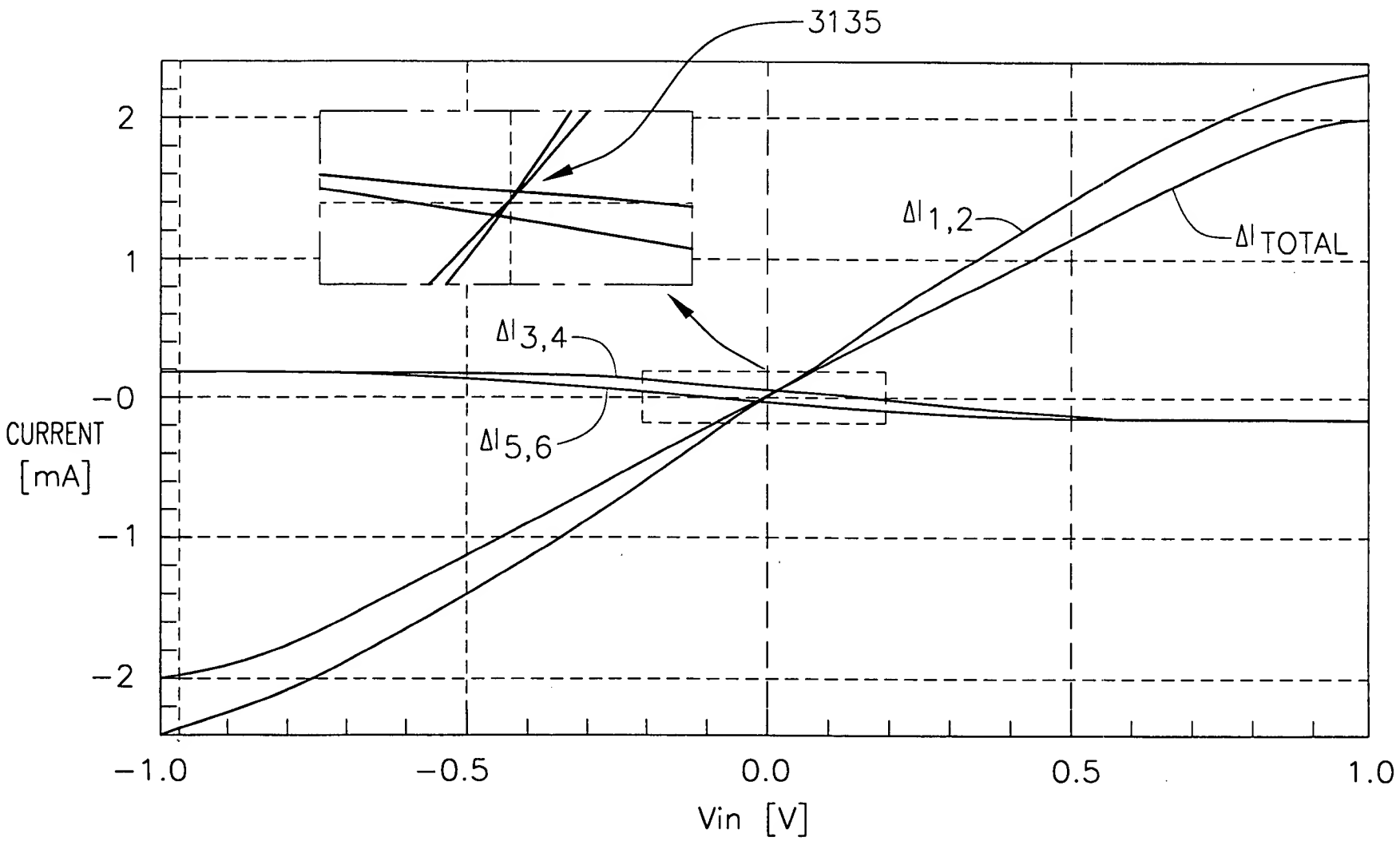


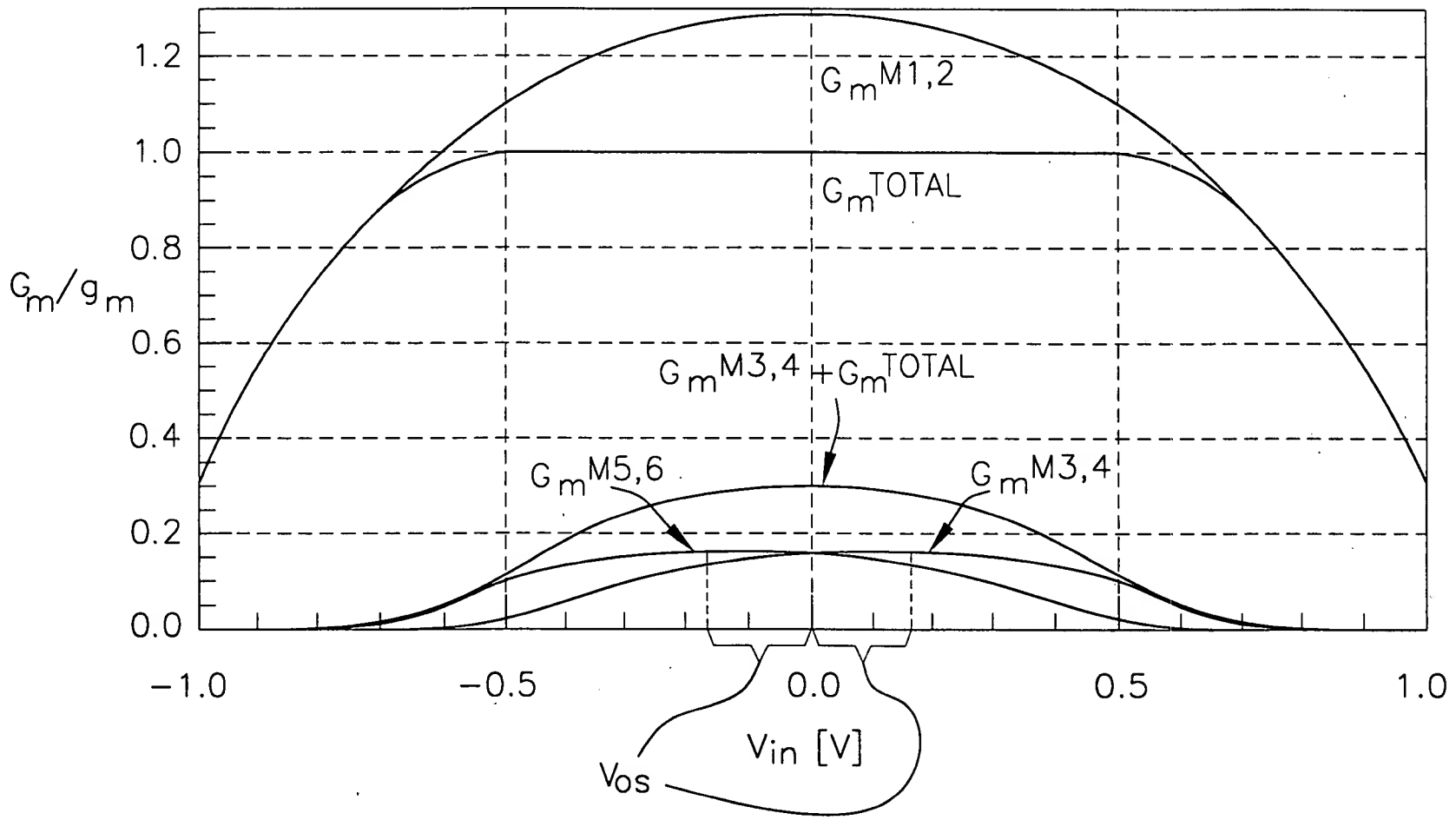
FIG.31i

FIG.31j


3135
2
1
−0
−1
−2
CURRENT
[mA]
ΔI1,2
ΔITOTAL
ΔI3,4
ΔI5,6
−1.0
−0.5
0.0
0.5
1.0
Vin [V]

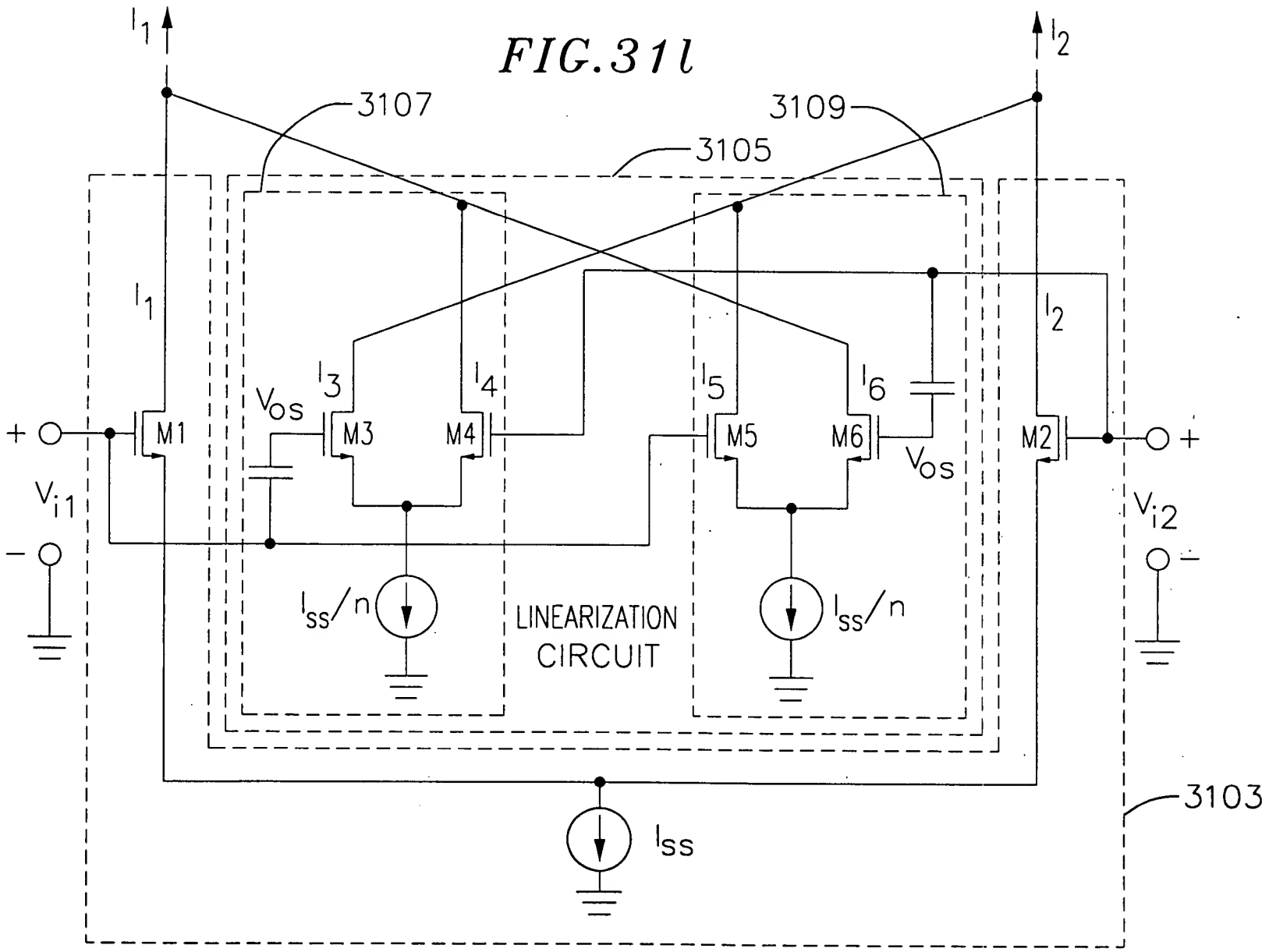
09782 "0782260

FIG.31k



0951EP 01E8260

FIG.31l



0057E 0N6020

FIG.31m

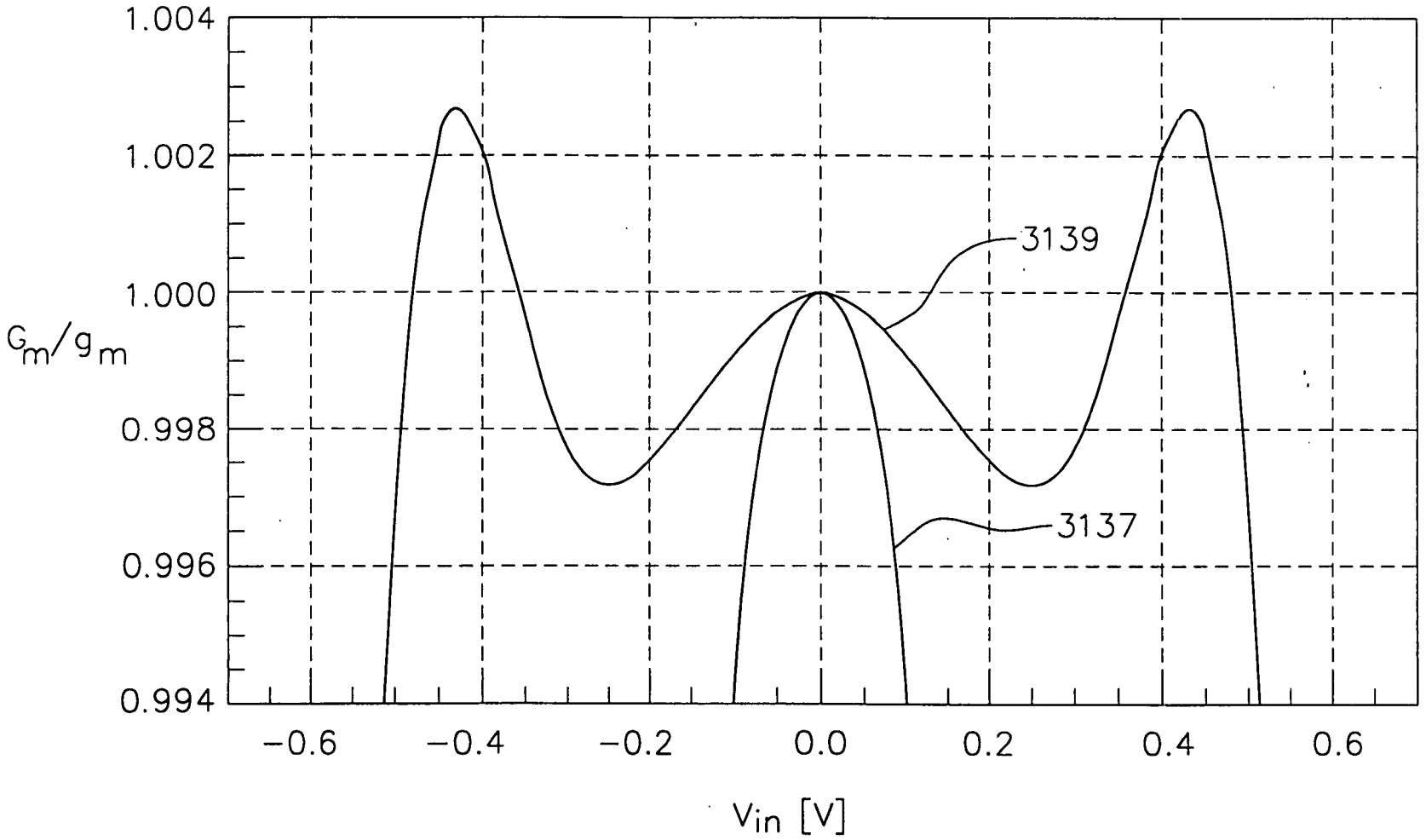
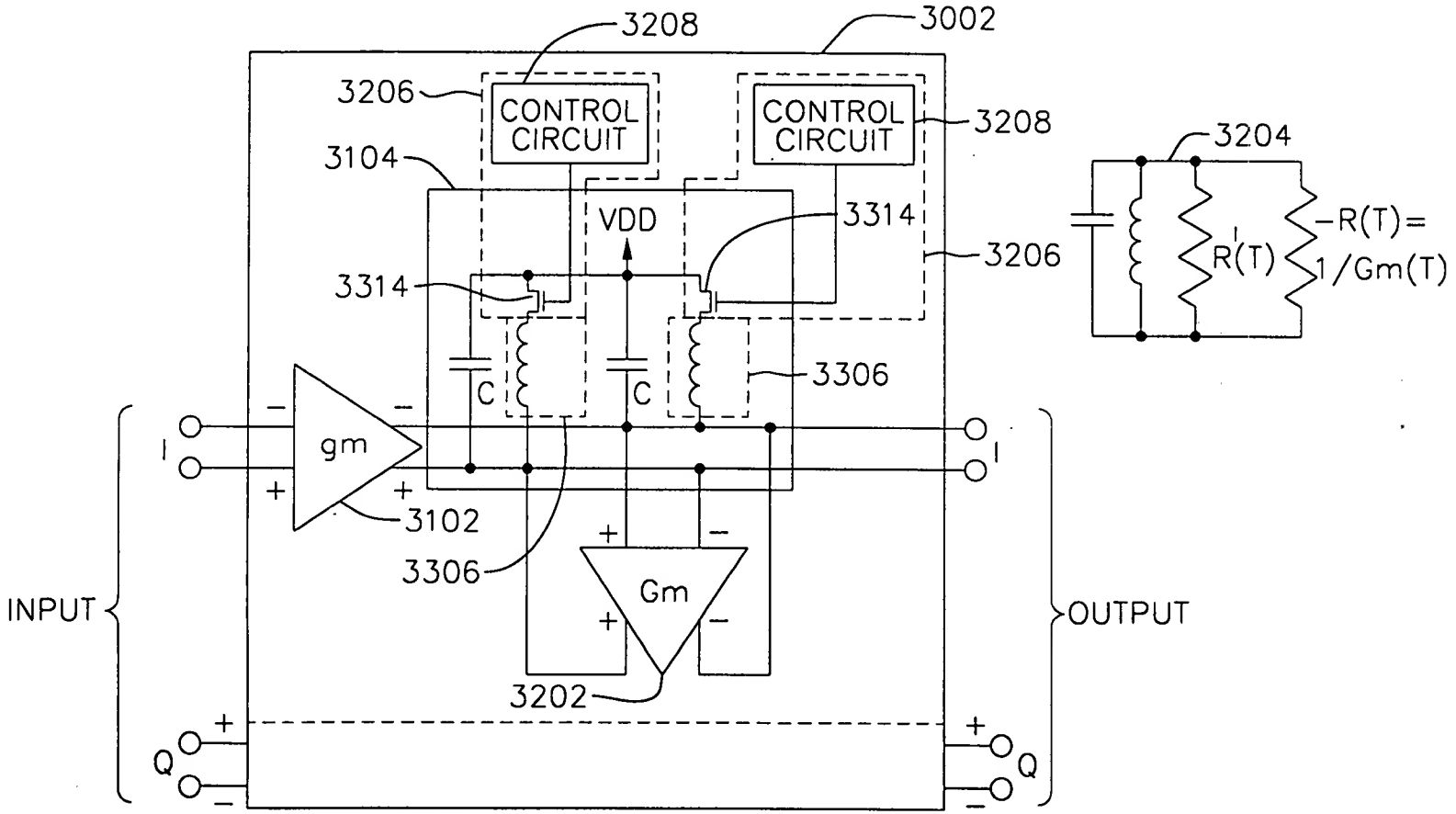
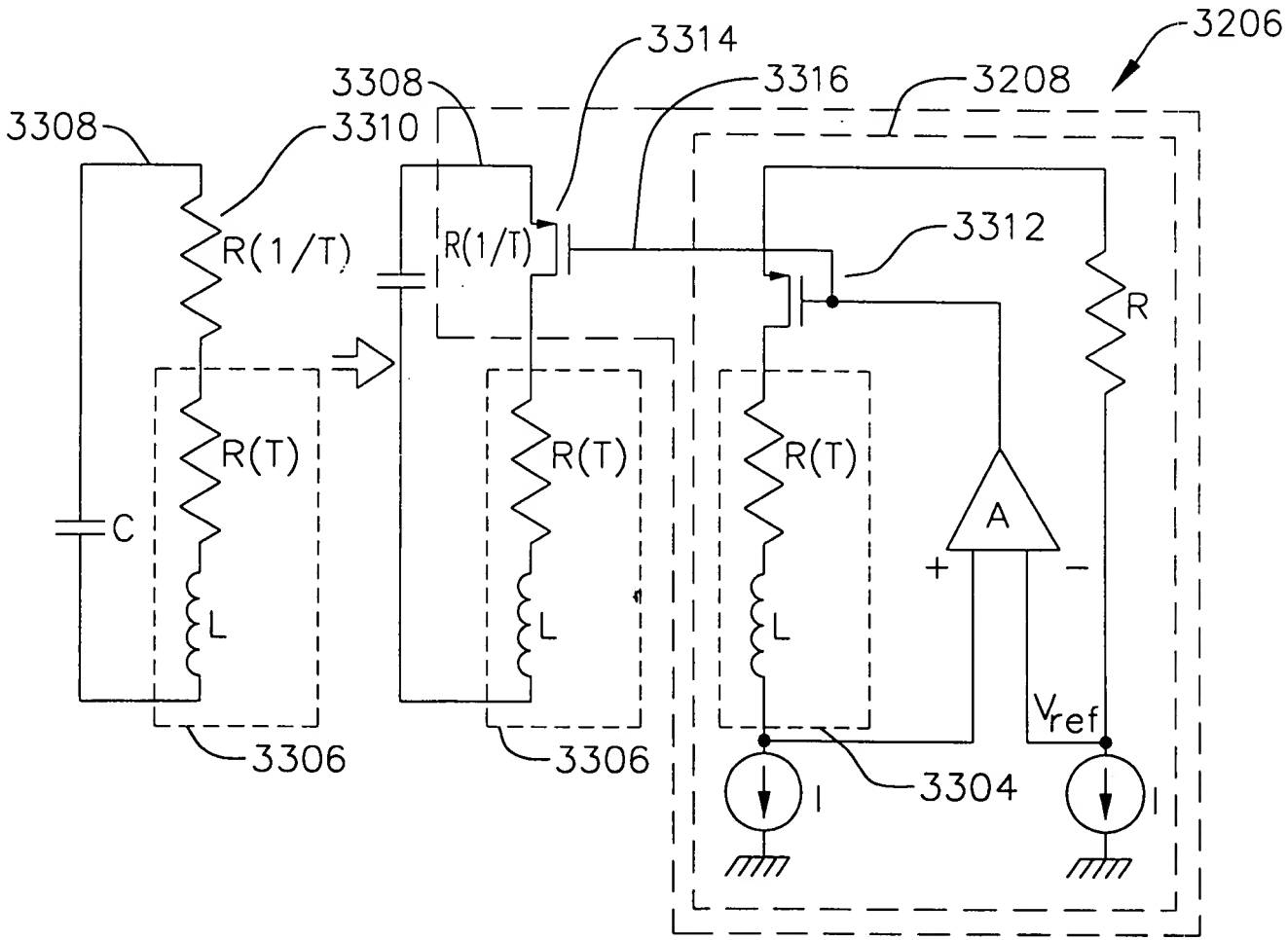


FIG.32


3208
3002
3206
CONTROL CIRCUIT
CONTROL CIRCUIT
3208
3104
VDD
3314
3314
3206
C
C
3306
gm
3102
3306
Gm
3202
INPUT
OUTPUT
I
I
Q
Q
+
−
3204
R(T)
R(T)=
1/Gm(T)

DOCKET ORIGINAL

FIG.33



US6215360B1

FIG. 34

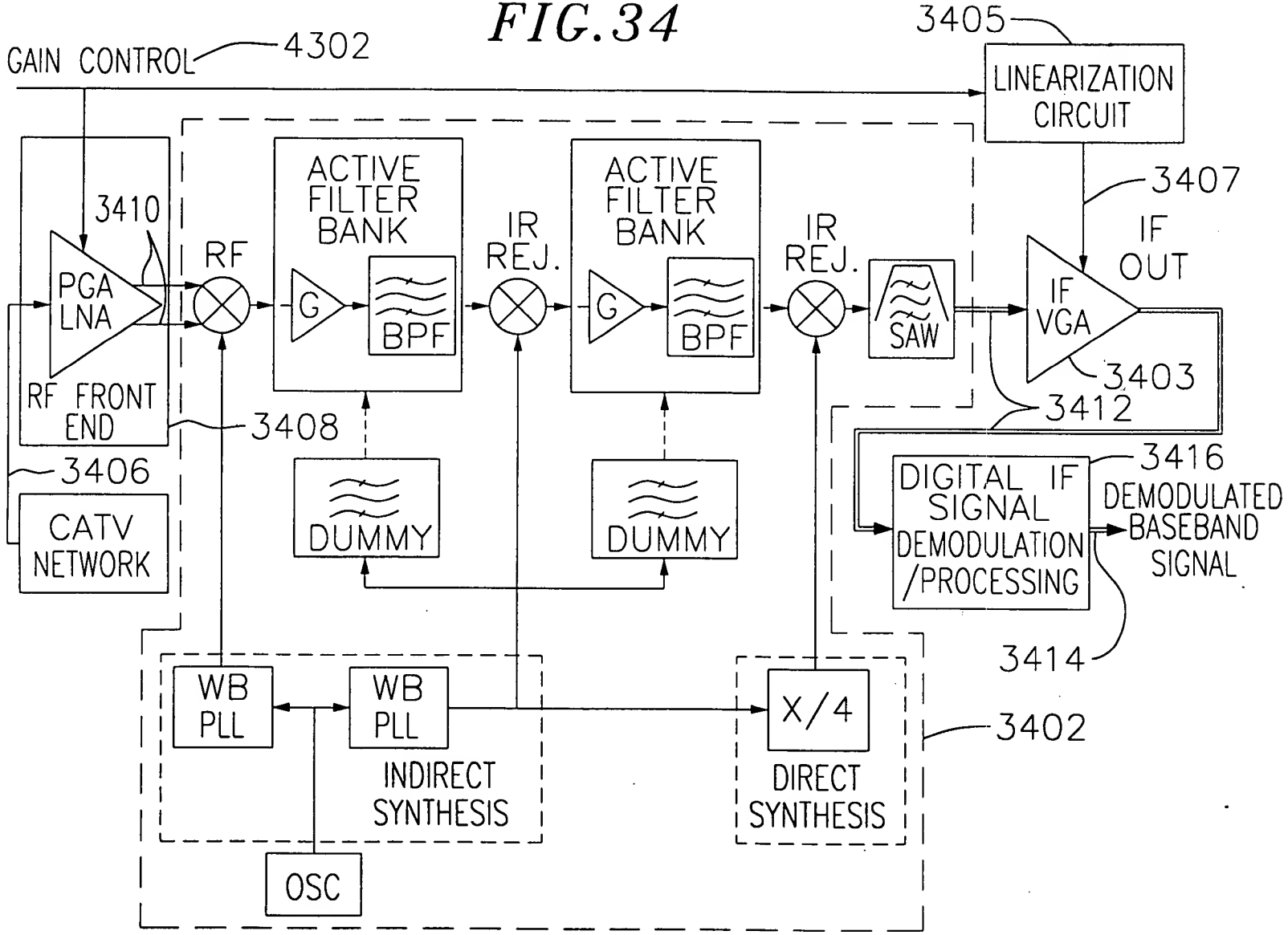
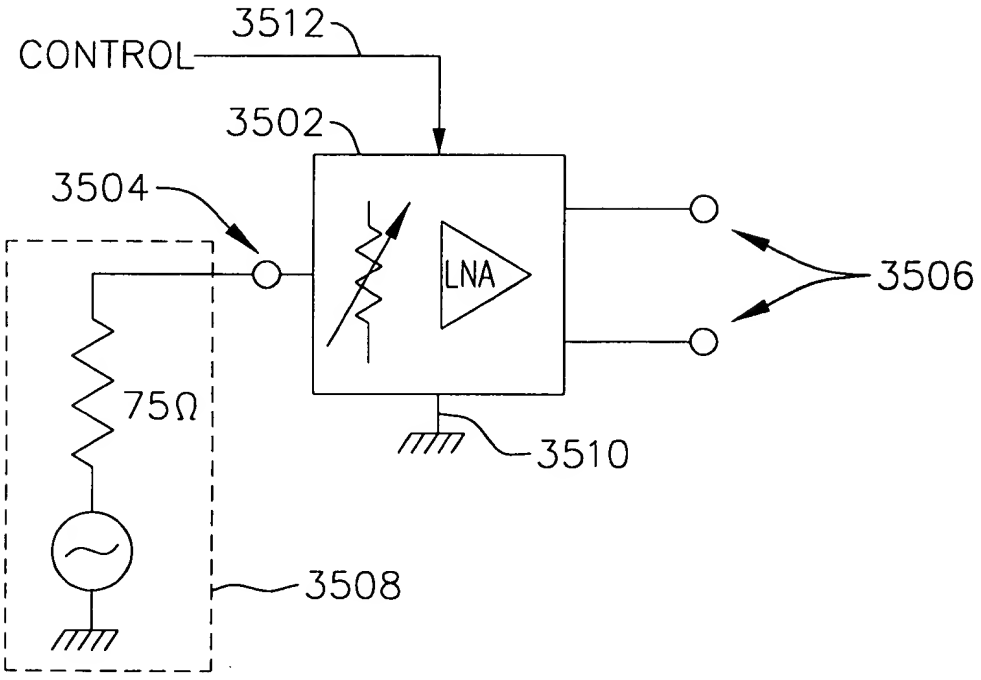


FIG.35



DOCKET ONE62260

FIG.36

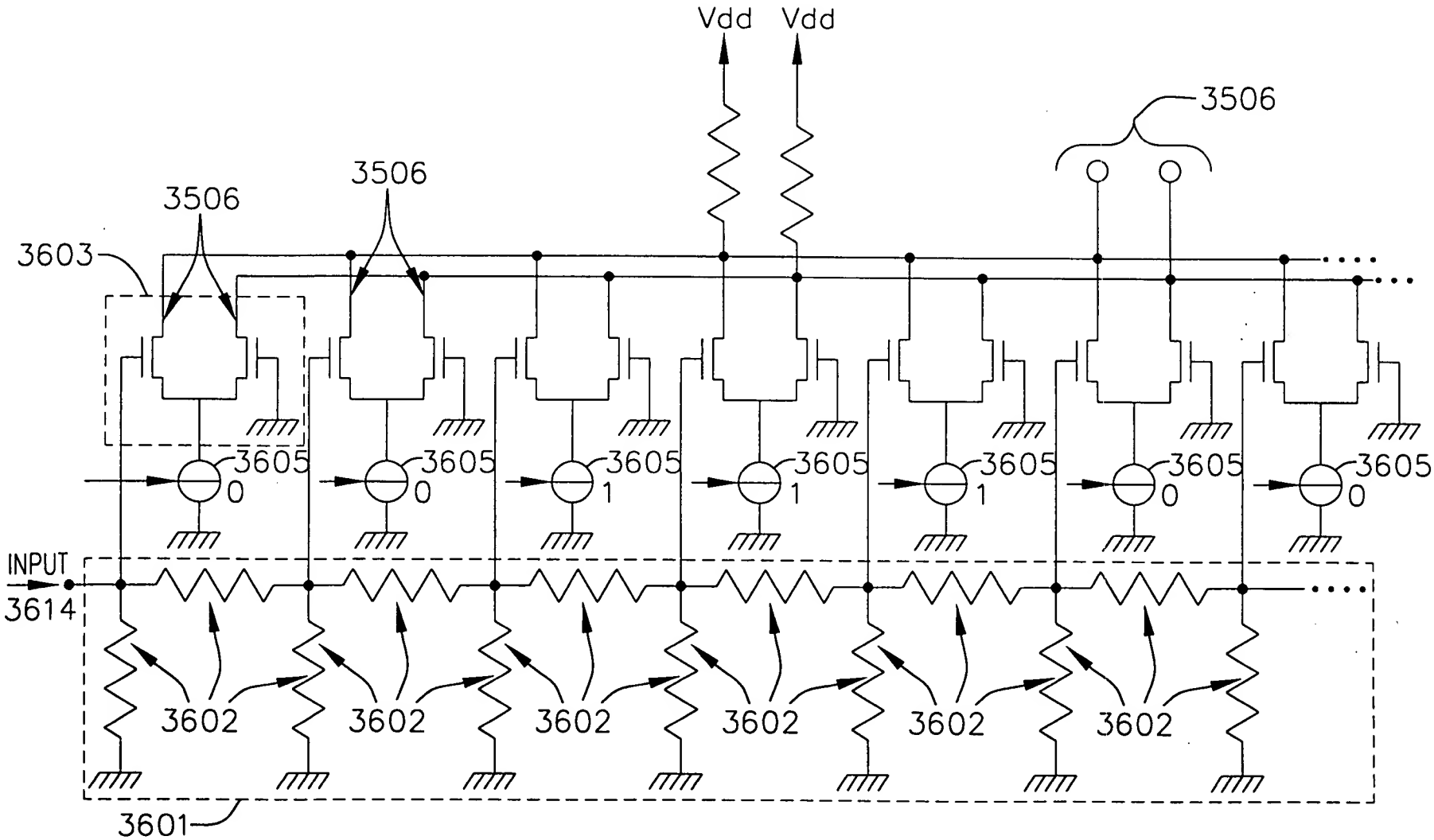


FIG.37

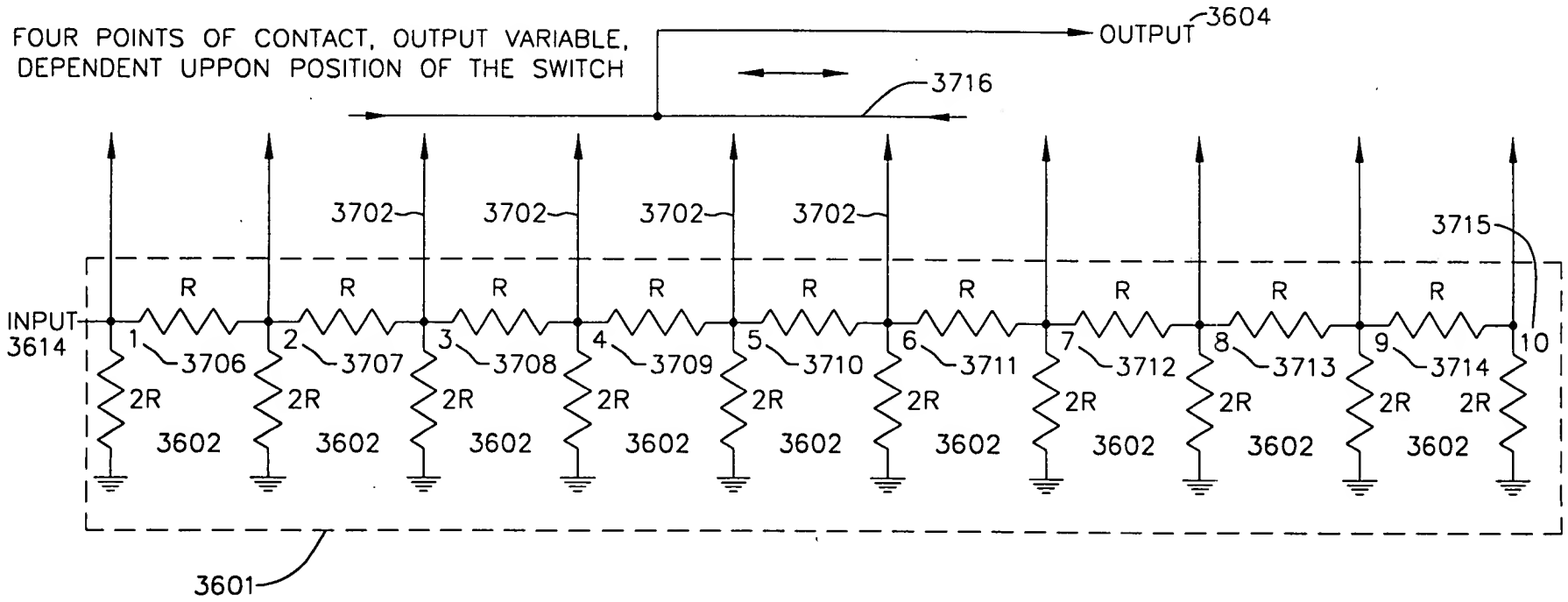
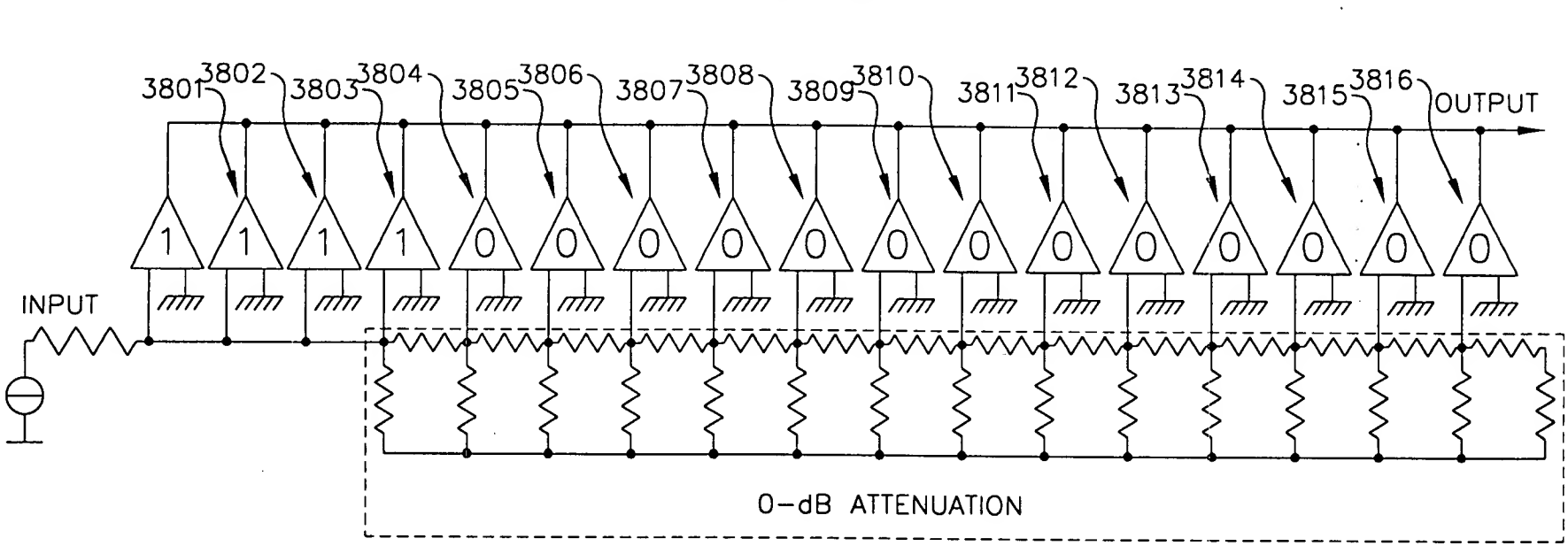

FOUR POINTS OF CONTACT, OUTPUT VARIABLE, DEPENDENT UPPON POSITION OF THE SWITCH
OUTPUT
3604
3716
3702
3715
R
INPUT
3614
1
2
3
4
5
6
7
8
9
10
3706
3707
3708
3709
3710
3711
3712
3713
3714
2R
3602
3601

FIG.38


PGA SETTINGS
3801
3802
3803
3804
3805
3806
3807
3808
3809
3810
3811
3812
3813
3814
3815
3816
OUTPUT
1
1
1
1
0
0
0
0
0
0
0
0
0
0
0
0
INPUT
0-dB ATTENUATION

0037421 0182600

FIG.39

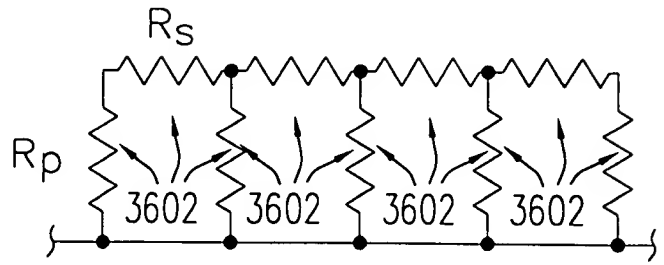


FIG.40

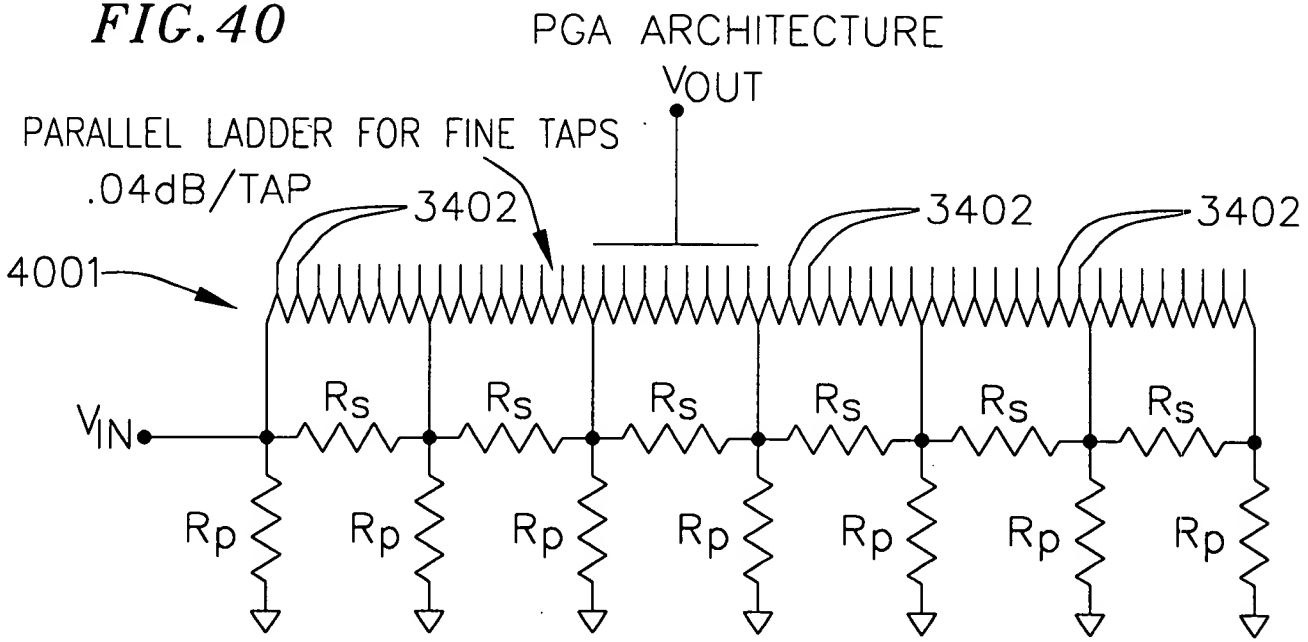


FIG.41

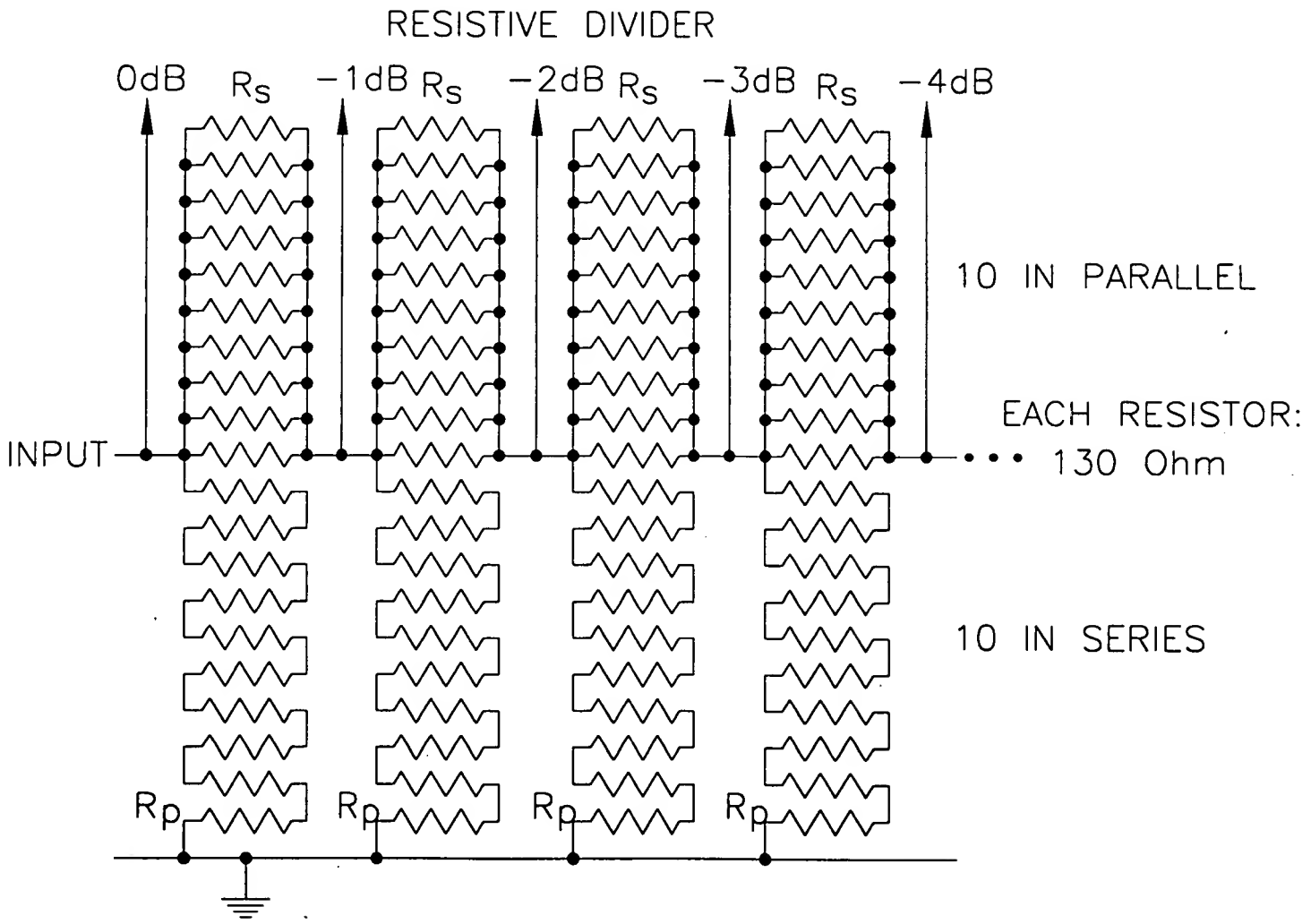

RESISTIVE DIVIDER
0dB
Rs
−1dB
Rs
−2dB
Rs
−3dB
Rs
−4dB
10 IN PARALLEL
EACH RESISTOR:
130 Ohm
INPUT
10 IN SERIES
Rp
Rp
Rp
Rp

FIG. 42

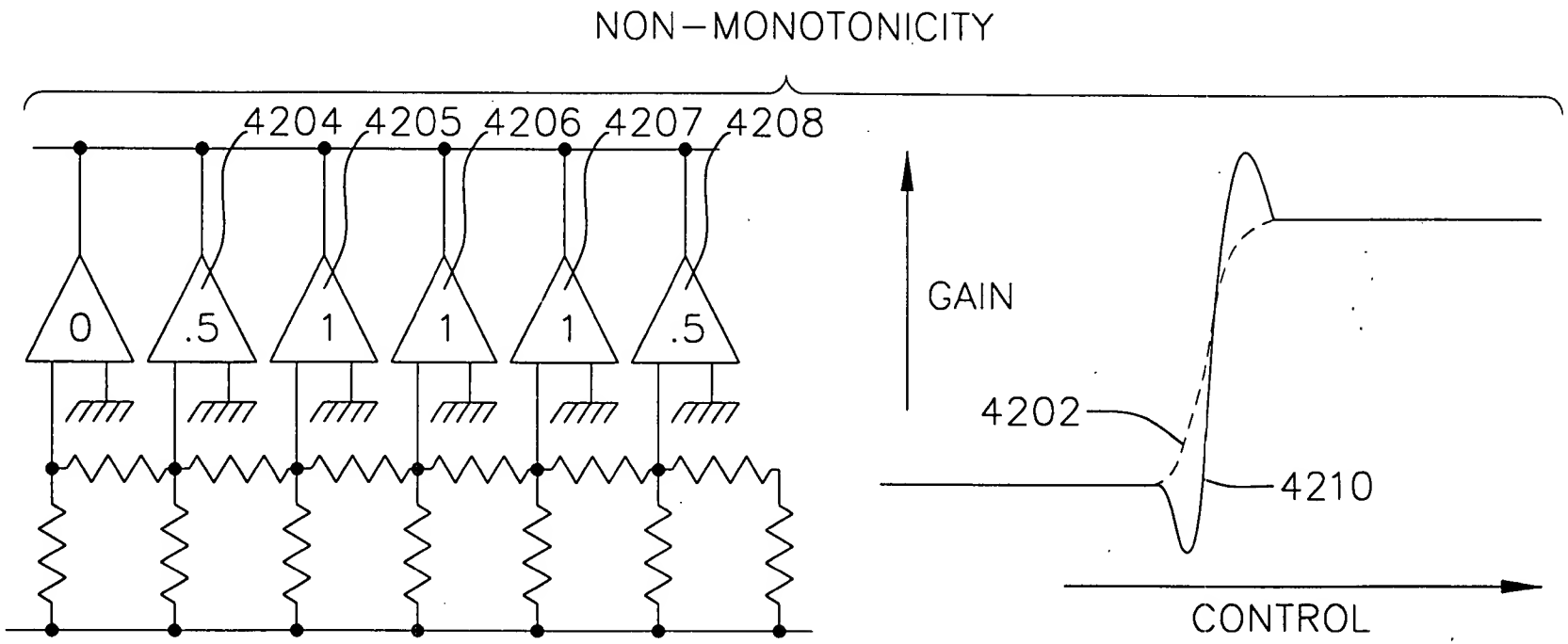

NON–MONOTONICITY
4204
4205
4206
4207
4208
0
.5
1
1
1
.5
GAIN
4202
4210
CONTROL

FIG. 43

CLAMPING CONTROL RANGE

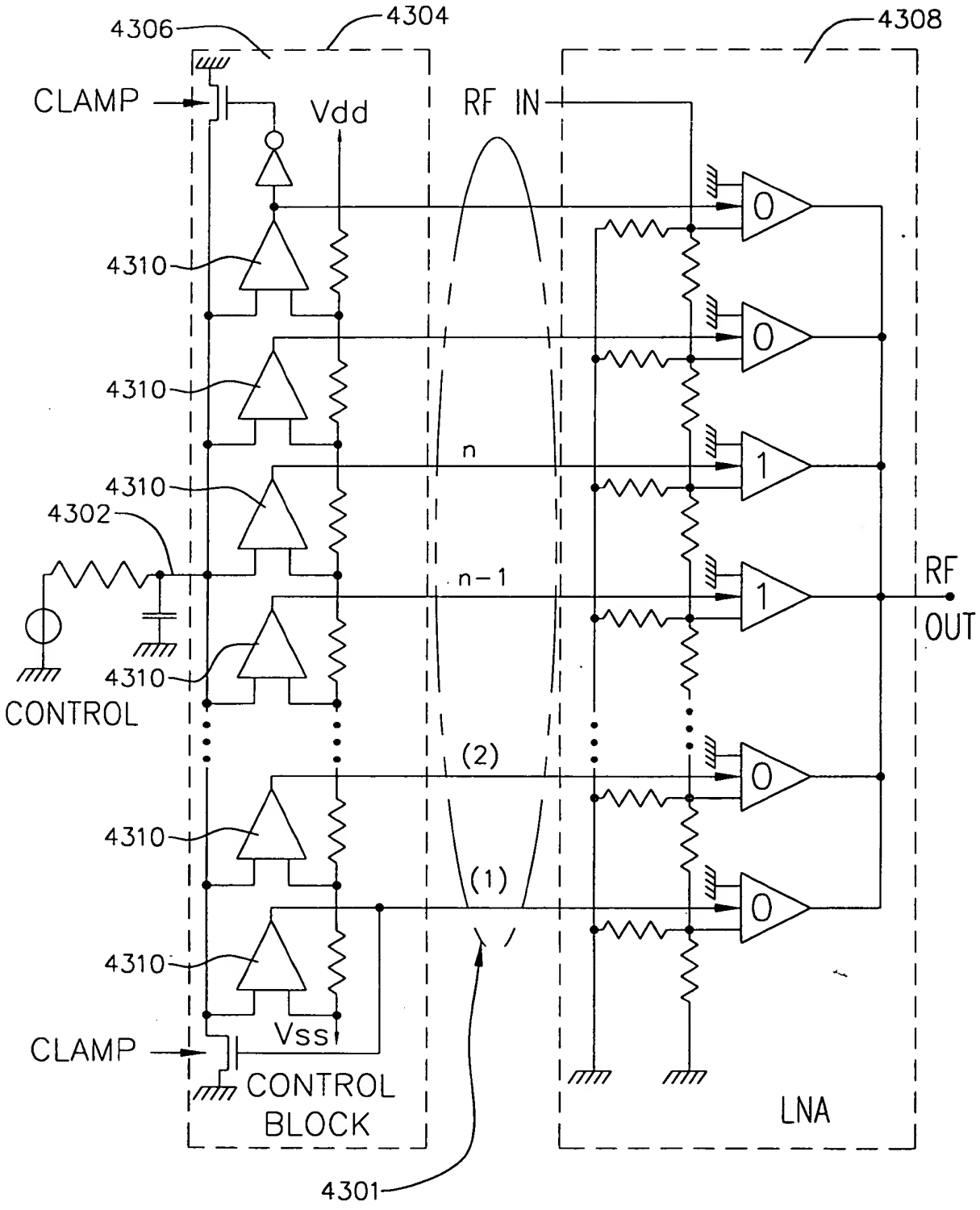
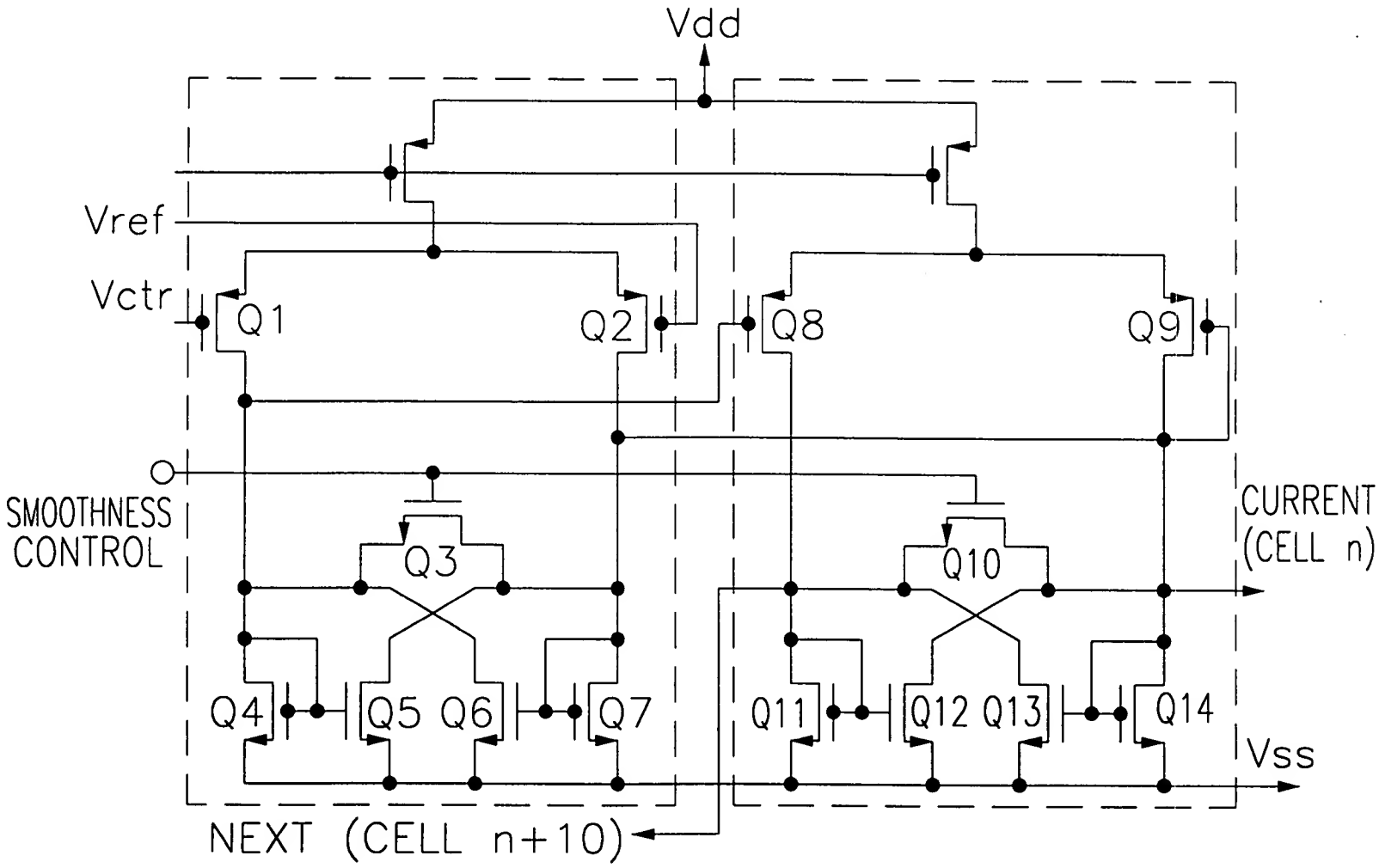


FIG.44α


CONTROLLED GAIN COMPARATOR
Vdd
Vref
Vctr
Q1
Q2
Q8
Q9
SMOOTHNESS CONTROL
Q3
Q10
CURRENT (CELL n)
Q4
Q5 Q6
Q7
Q11
Q12 Q13
Q14
Vss
NEXT (CELL n+10)

08512" 0102208

FIG.44b

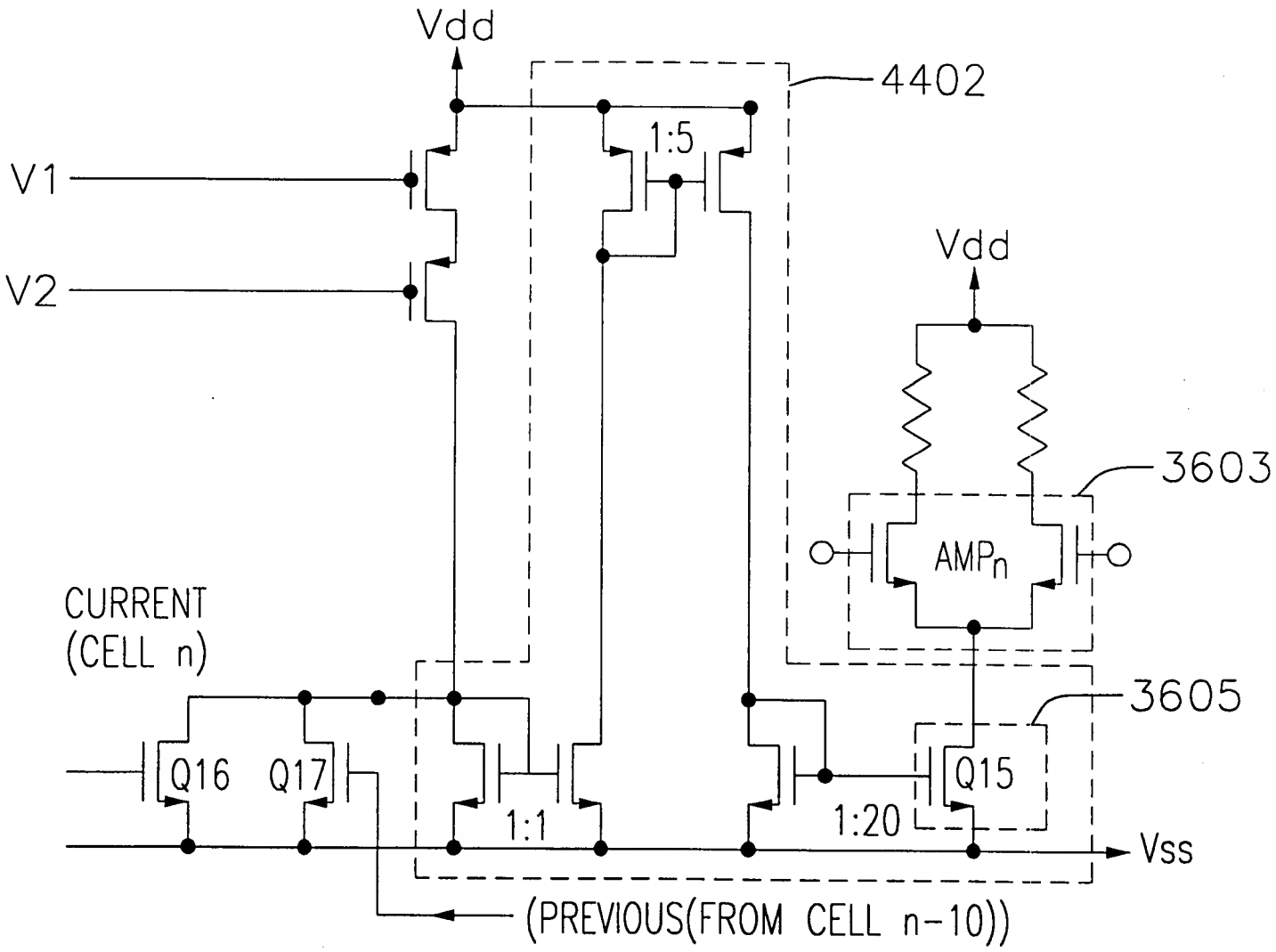


FIG. 45a

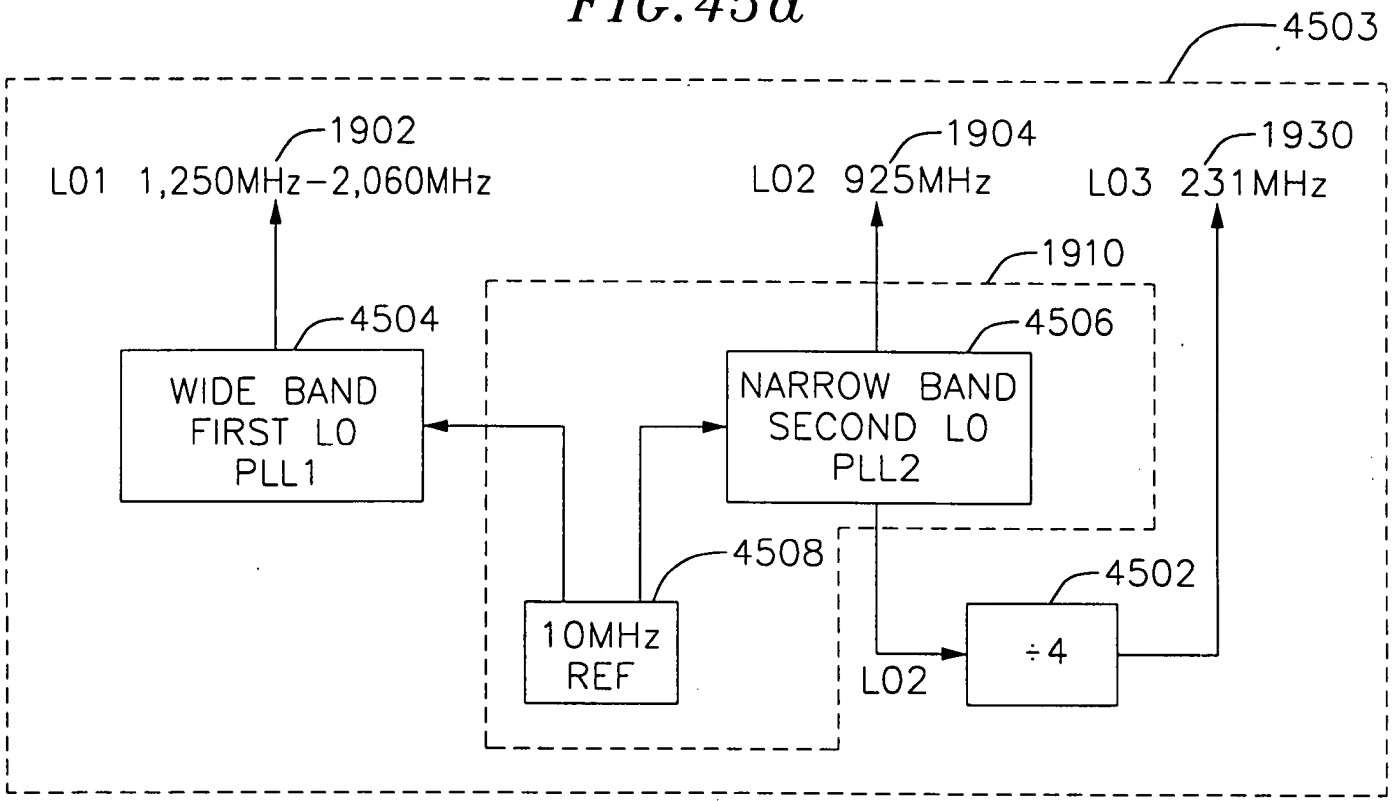
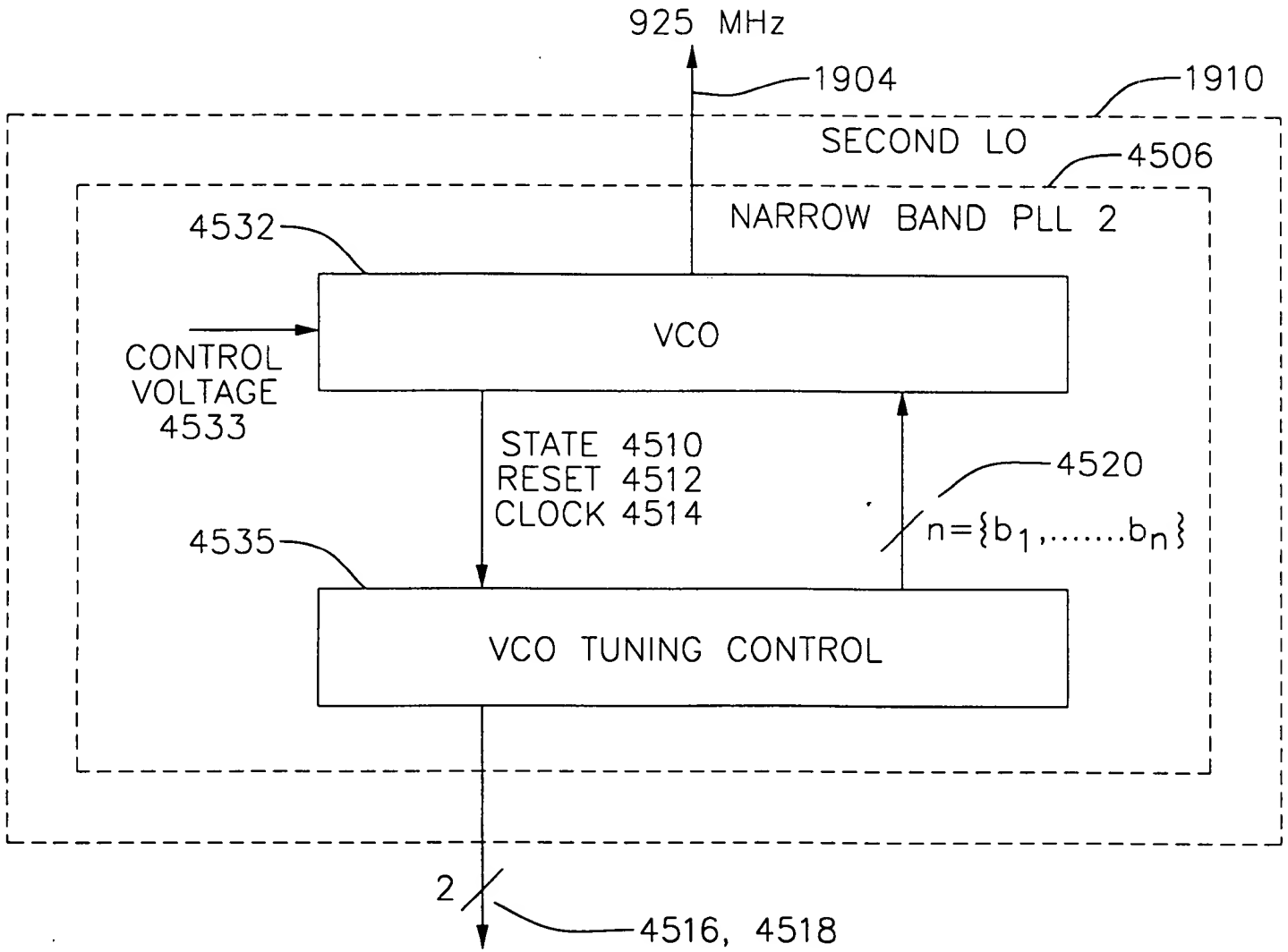
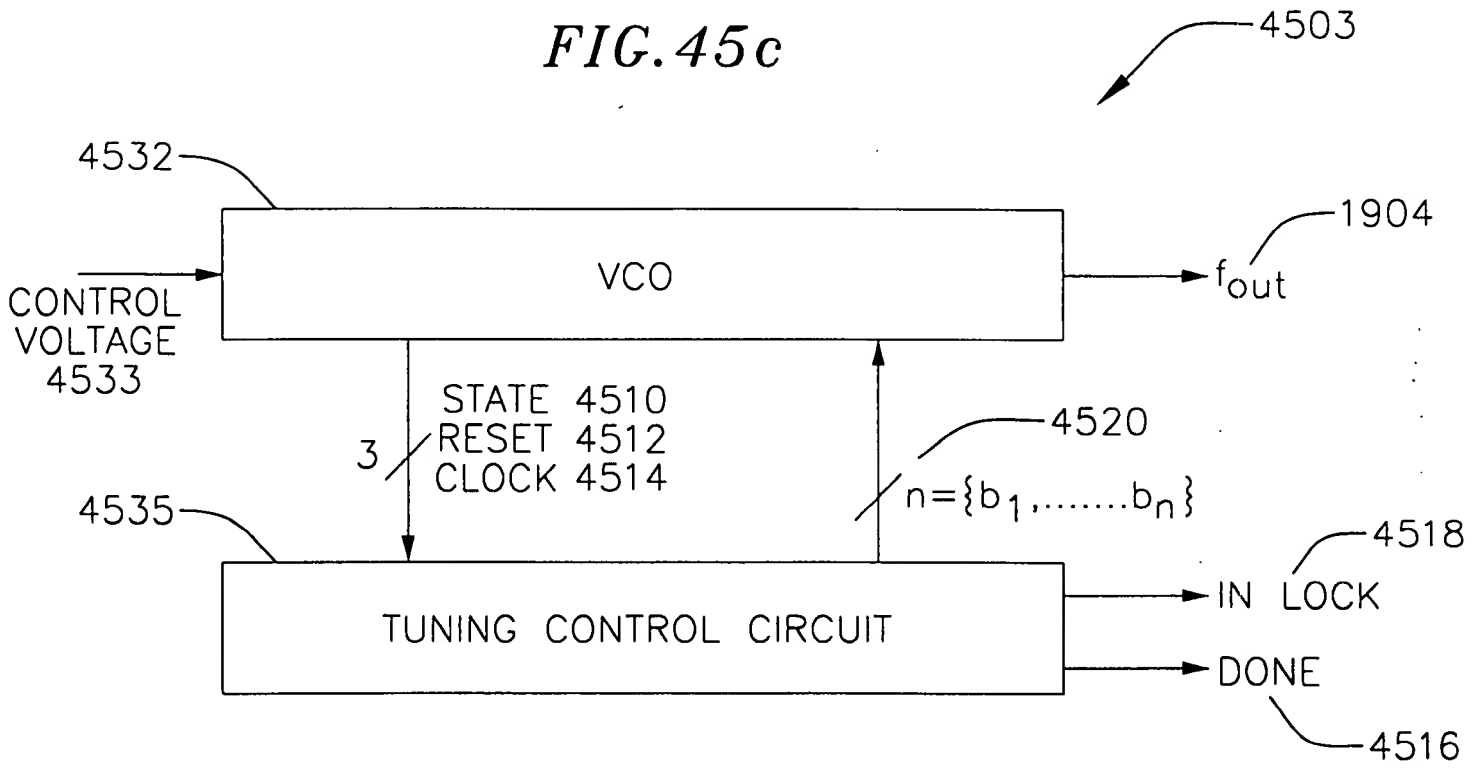

4503
1902
L01 1,250MHz–2,060MHz
1904
L02 925MHz
1930
L03 231MHz
1910
4504
4506
WIDE BAND
FIRST LO
PLL1
NARROW BAND
SECOND LO
PLL2
4508
4502
10MHz
REF
÷4
L02

FIG. 45b


925 MHz
1904
1910
SECOND LO
4506
NARROW BAND PLL 2
4532
VCO
CONTROL VOLTAGE 4533
STATE 4510
RESET 4512
CLOCK 4514
4520
n={b1,.....bn}
4535
VCO TUNING CONTROL
2
4516, 4518

DOCKET ONE0260

FIG. 45c



0057E7 0T62260

FIG. 45d

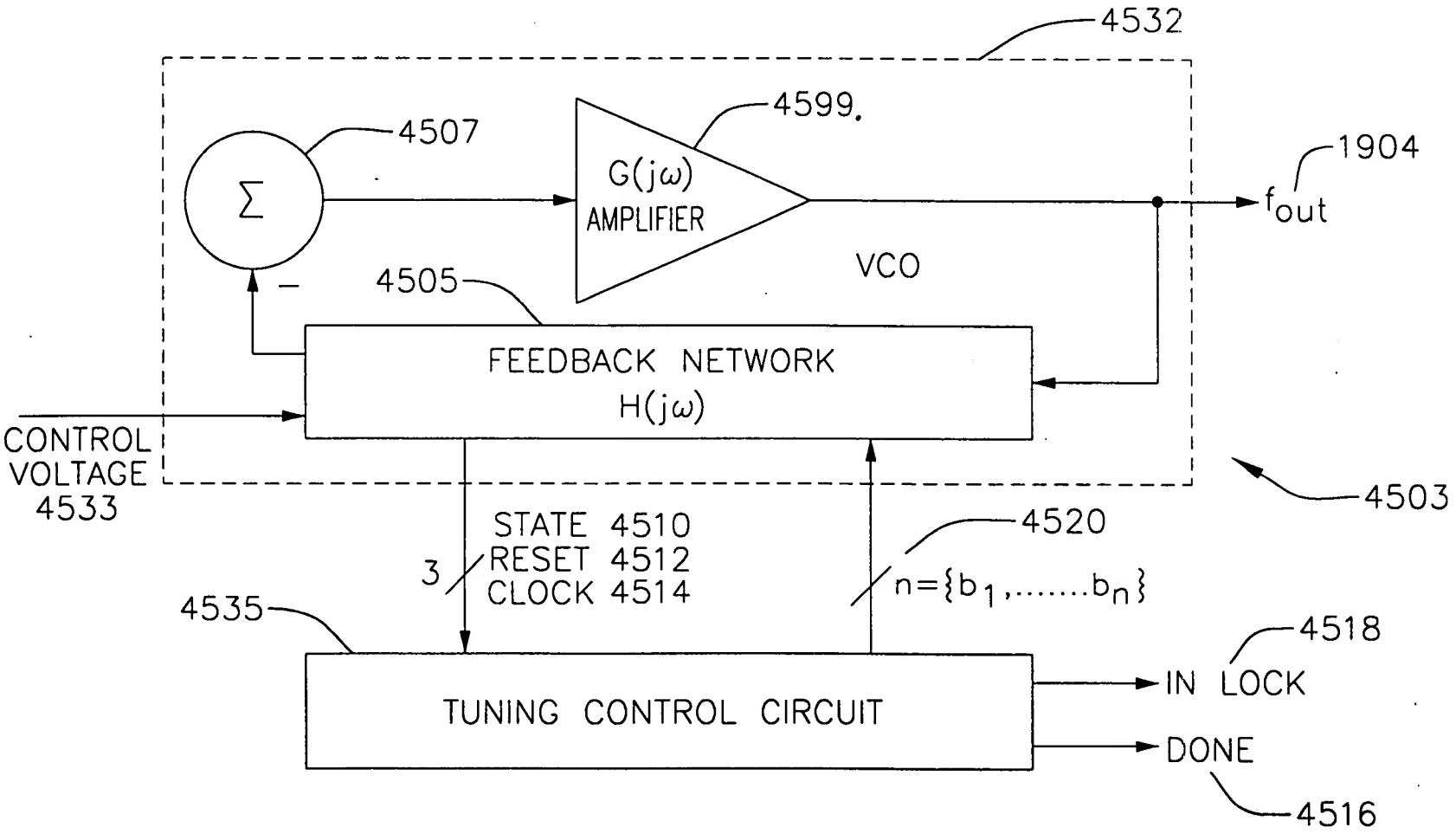


FIG. 45e

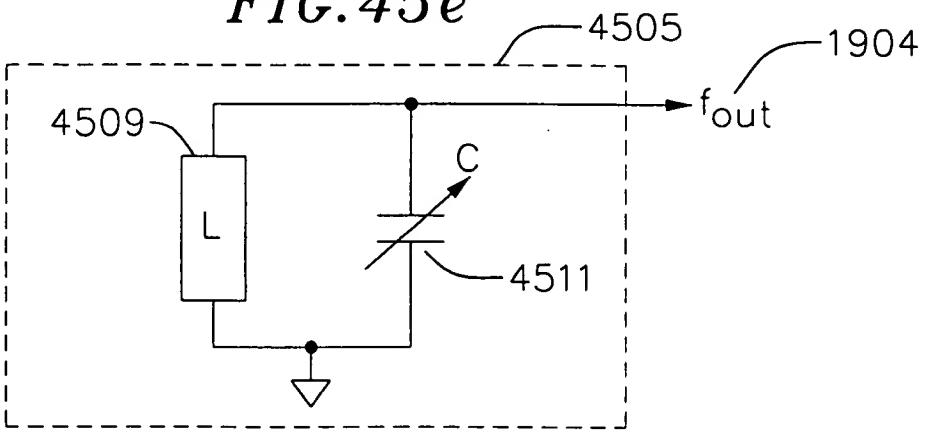


FIG. 45f

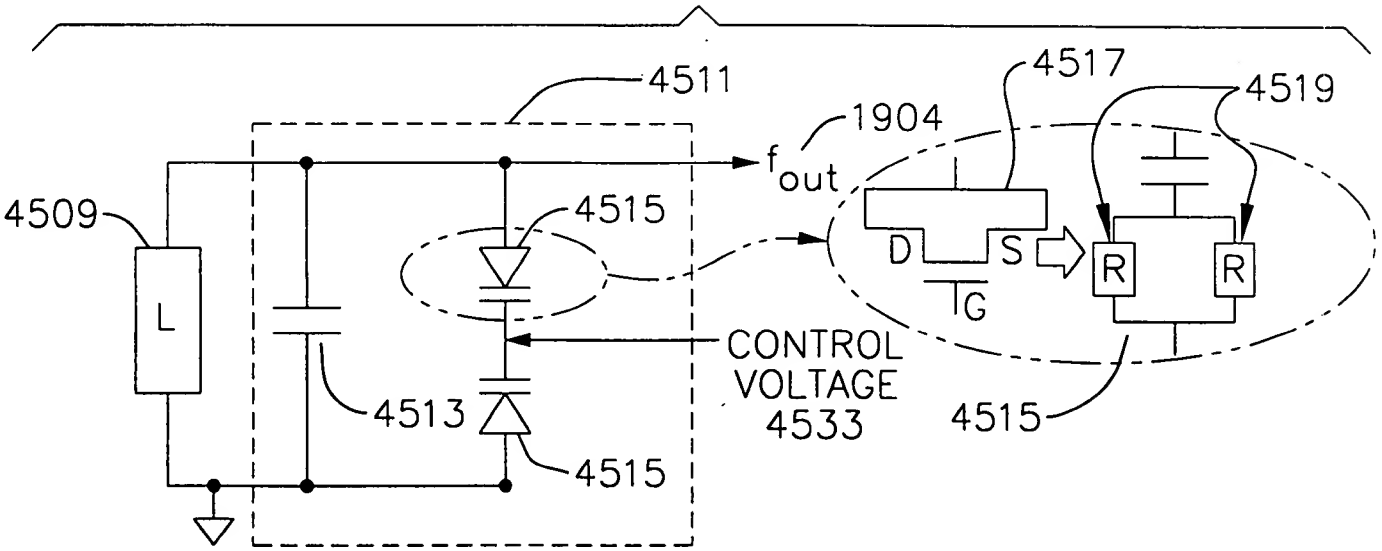


FIG.45g

CAPACITANCE VS CONTROL VOLTAGE

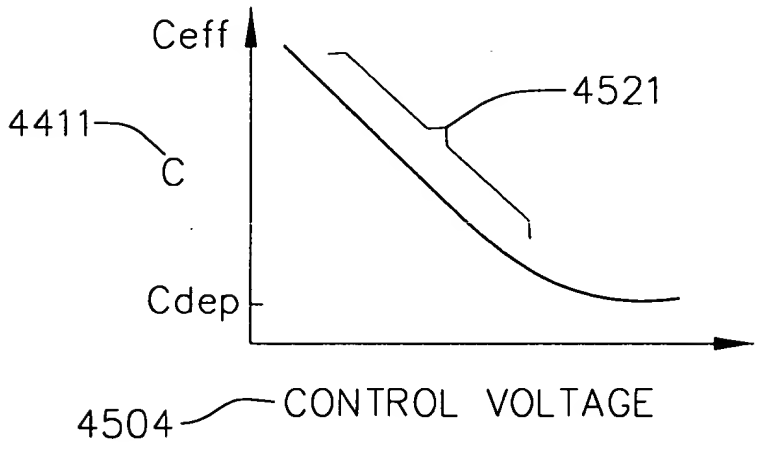


FIG.45h

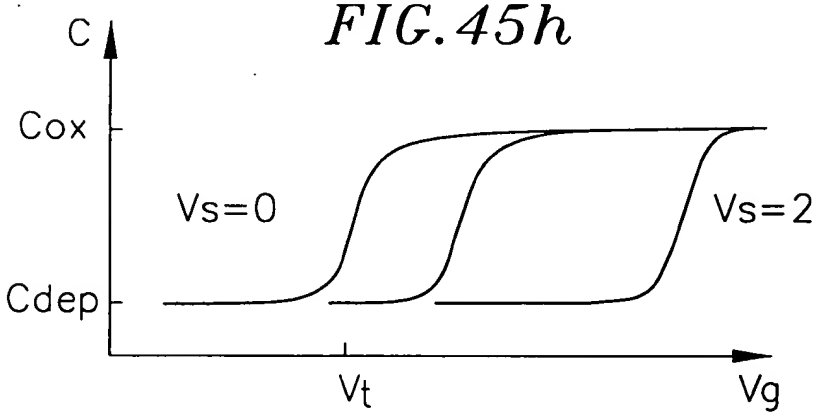


FIG.45j

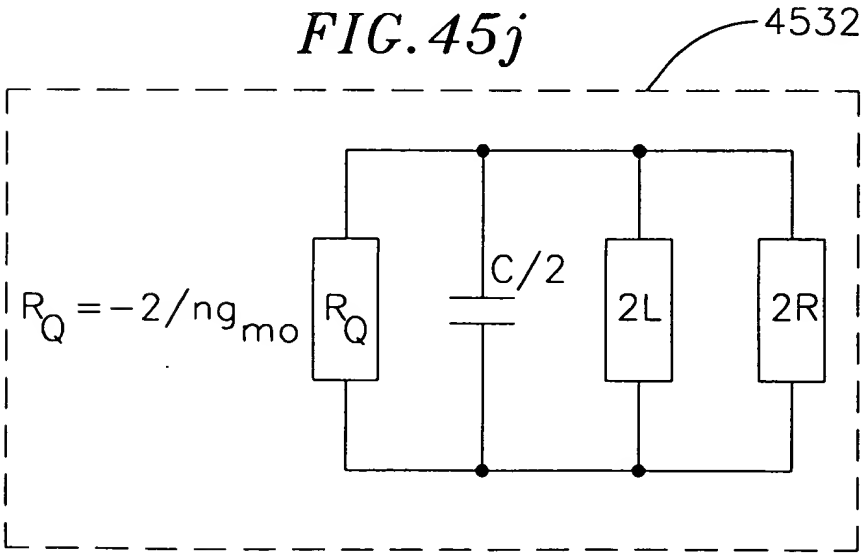
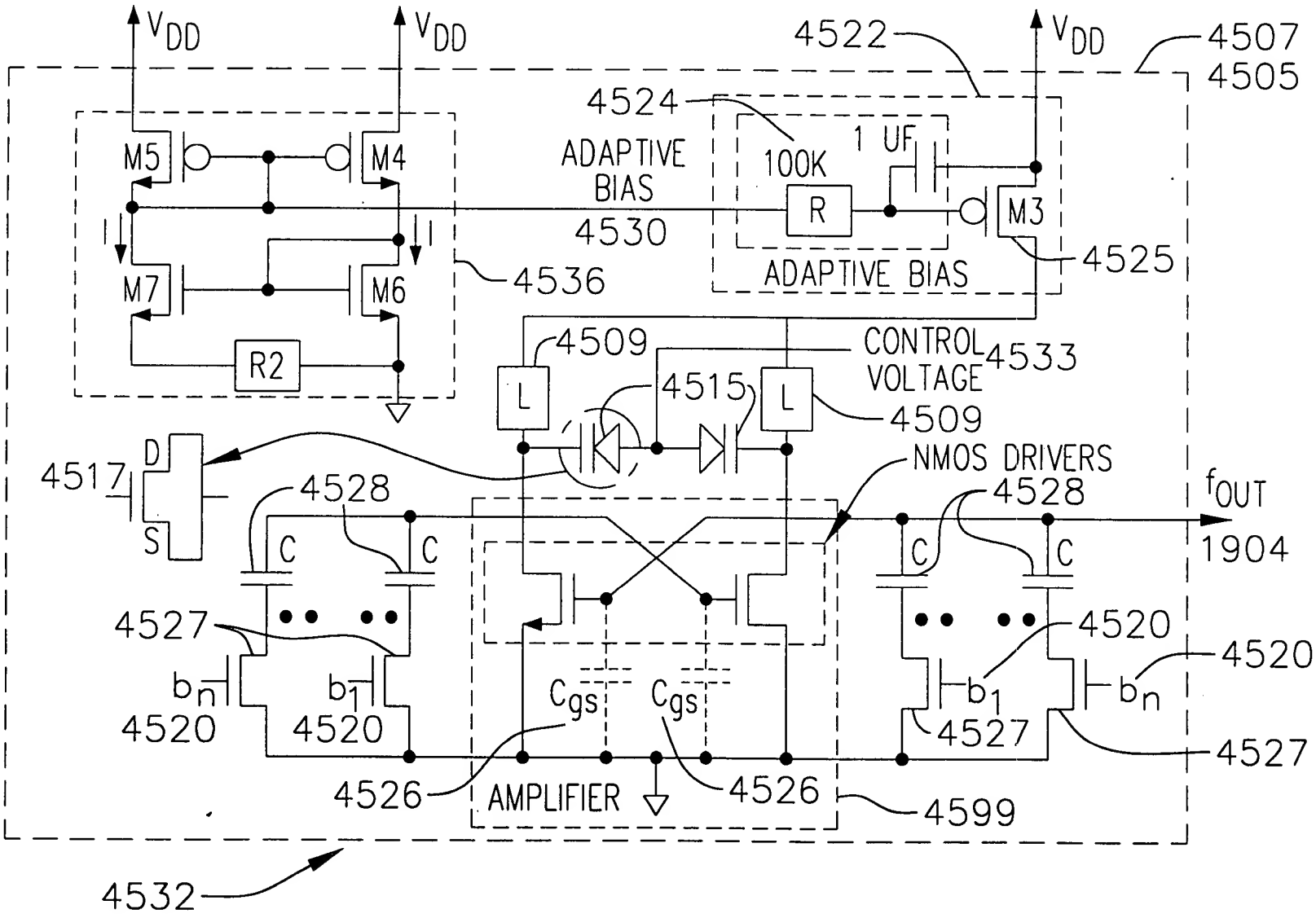
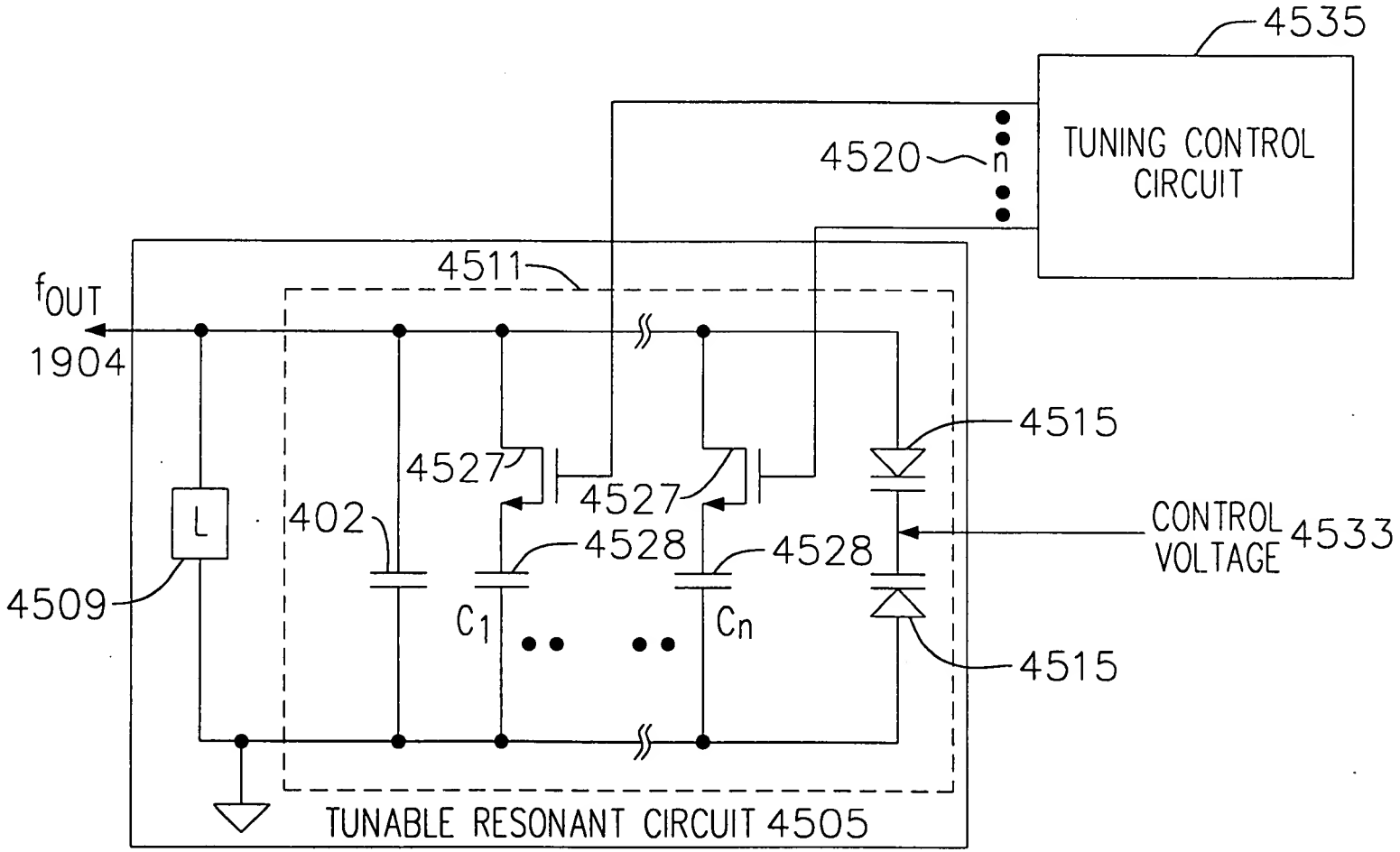


FIG.45i


V_{DD}
V_{DD}
V_{DD}
4522
4507
4505
4524
ADAPTIVE BIAS
4530
100K
1 UF
R
M3
4525
ADAPTIVE BIAS
M5
M4
M7
M6
R2
4536
4509
CONTROL VOLTAGE
4533
4515
L
L
4509
4517
D
S
NMOS DRIVERS
4528
4528
f_{OUT}
1904
C
C
C
C
4527
4520
4520
b_n
b_1
b_1
b_n
4520
4527
4527
C_{gs}
C_{gs}
4526
AMPLIFIER
4526
4599
4532

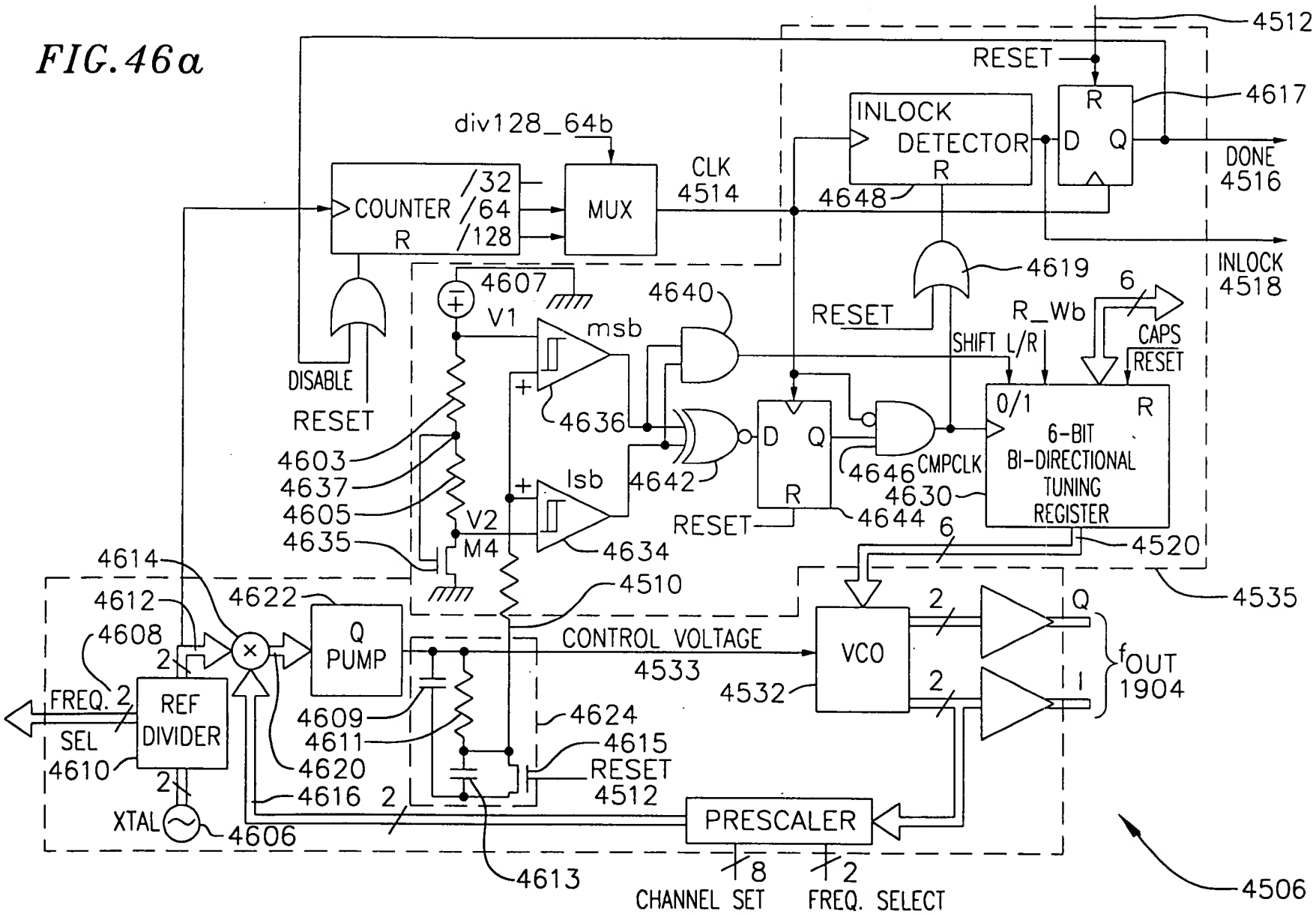
US 6,882,260 B2

FIG. 45k



DOCKET 6182260

FIG. 46a



DOCKET ONE2260

FIG.46b

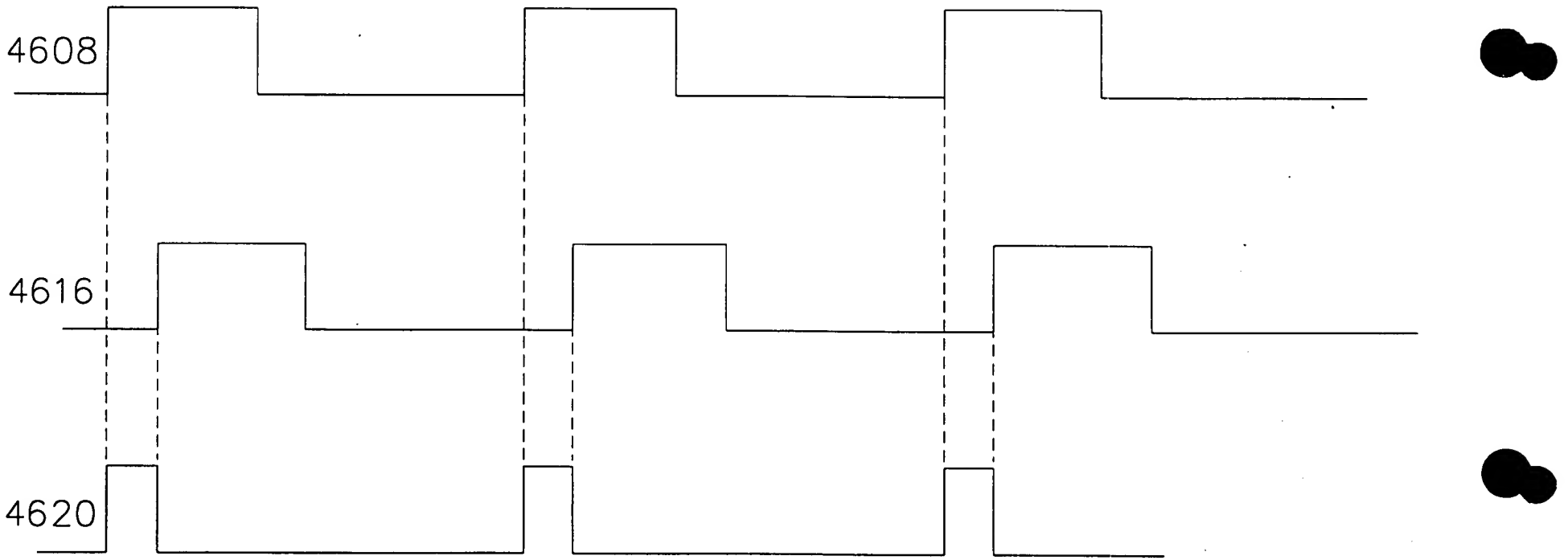


FIG. 47a

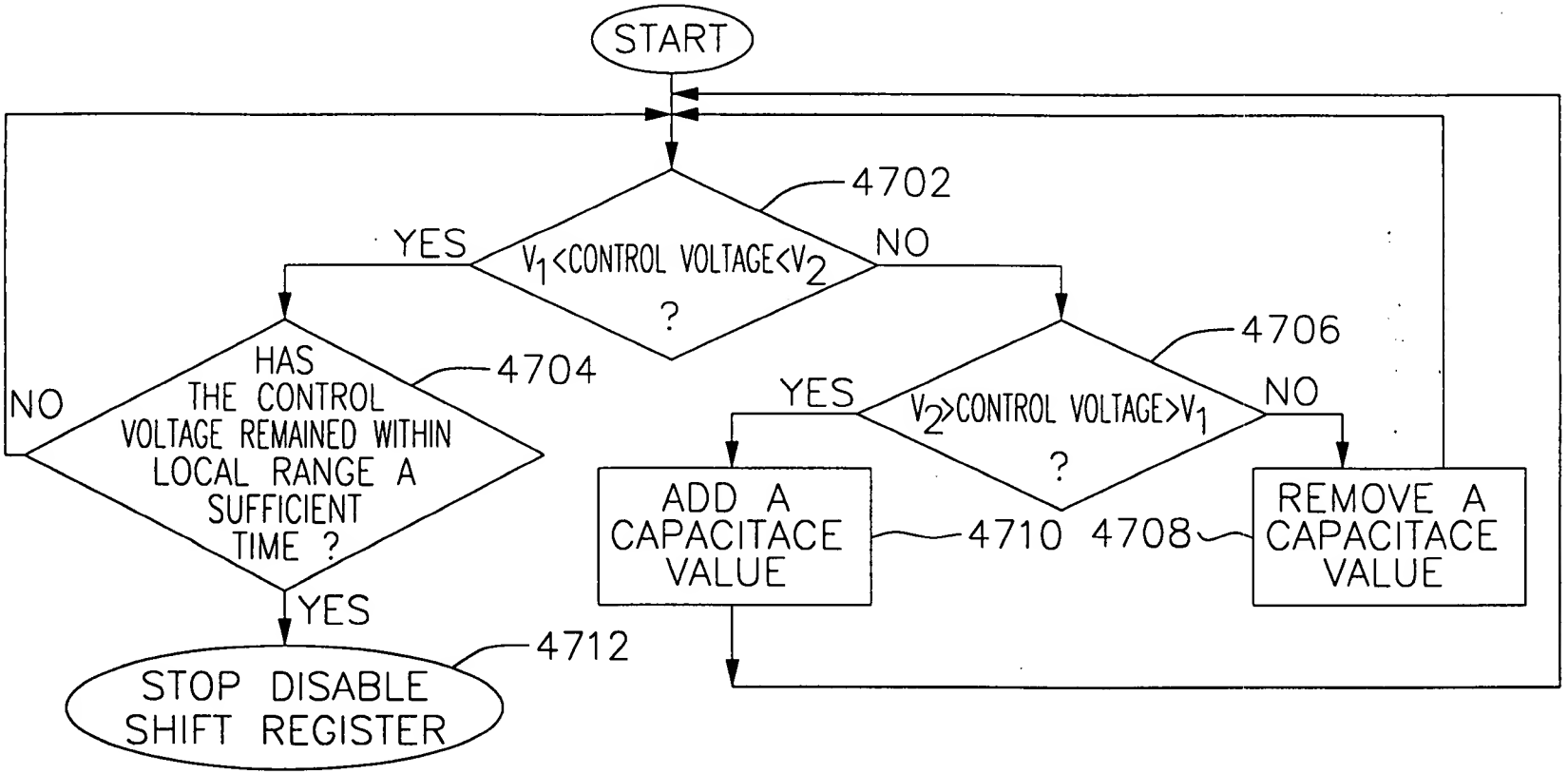
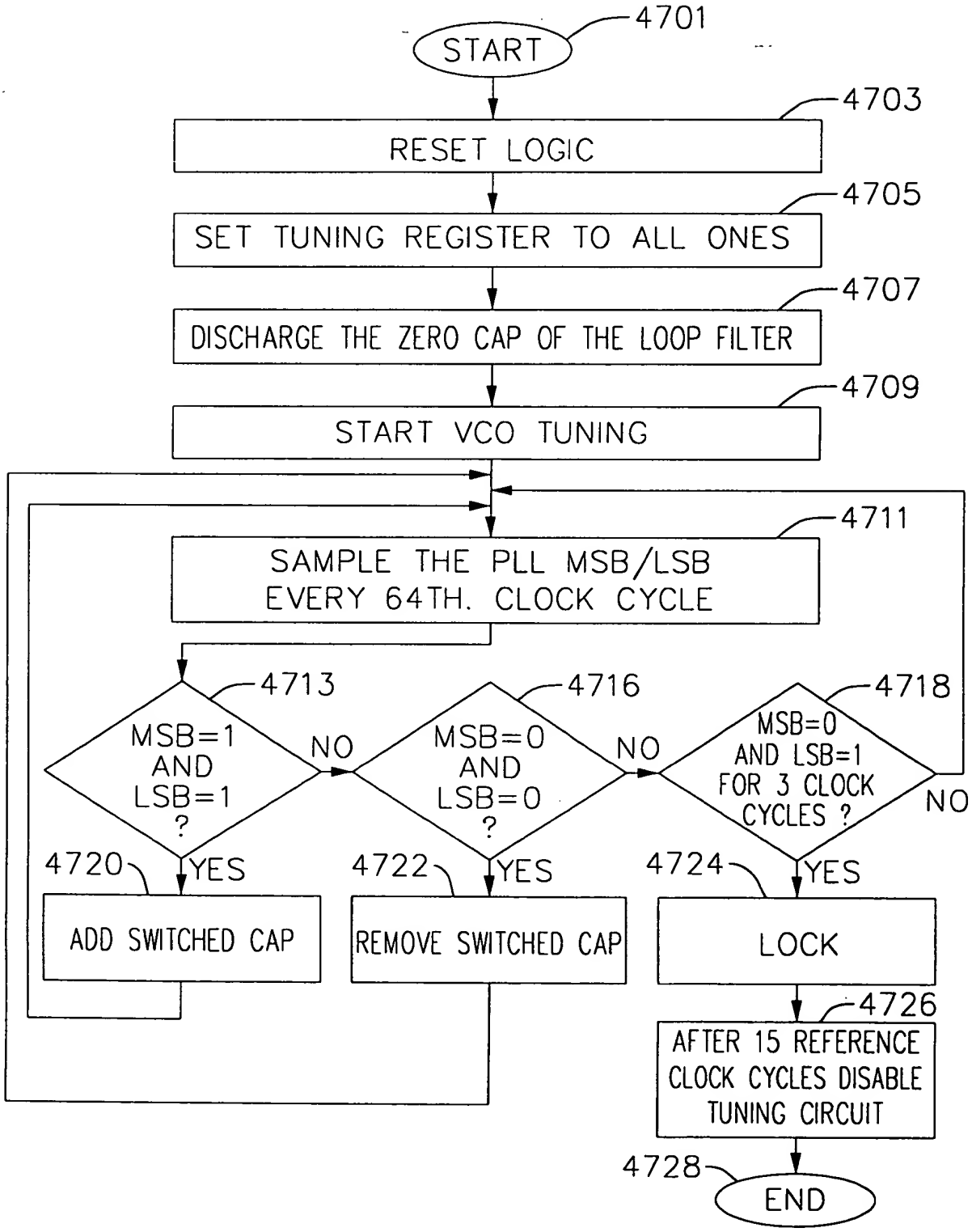

START
4702
YES
V_1<CONTROL VOLTAGE<V_2 ?
NO
HAS THE CONTROL VOLTAGE REMAINED WITHIN LOCAL RANGE A SUFFICIENT TIME ?
4704
NO
YES
4706
YES
V_2>CONTROL VOLTAGE>V_1 ?
NO
ADD A CAPACITACE VALUE
4710
4708
REMOVE A CAPACITACE VALUE
YES
4712
STOP DISABLE SHIFT REGISTER

FIG. 47b


4701
START
4703
RESET LOGIC
4705
SET TUNING REGISTER TO ALL ONES
4707
DISCHARGE THE ZERO CAP OF THE LOOP FILTER
4709
START VCO TUNING
4711
SAMPLE THE PLL MSB/LSB EVERY 64TH. CLOCK CYCLE
4713
MSB=1 AND LSB=1 ?
NO
4716
MSB=0 AND LSB=0 ?
NO
4718
MSB=0 AND LSB=1 FOR 3 CLOCK CYCLES ?
NO
YES
4720
ADD SWITCHED CAP
YES
4722
REMOVE SWITCHED CAP
YES
4724
LOCK
4726
AFTER 15 REFERENCE CLOCK CYCLES DISABLE TUNING CIRCUIT
4728
END

09124 U.S. PRO

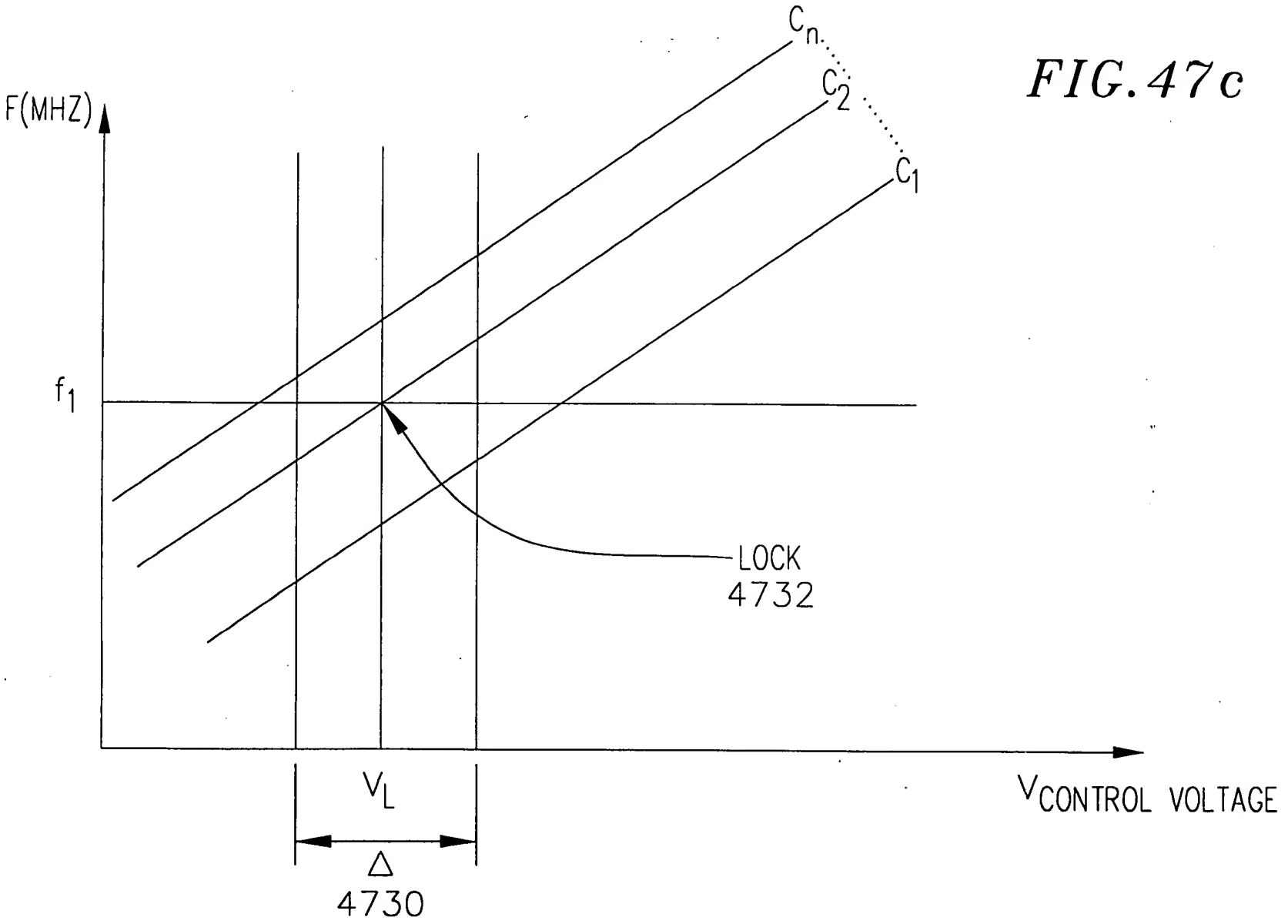


FIG. 47c

0057E7 0R20E20

FIG. 47d

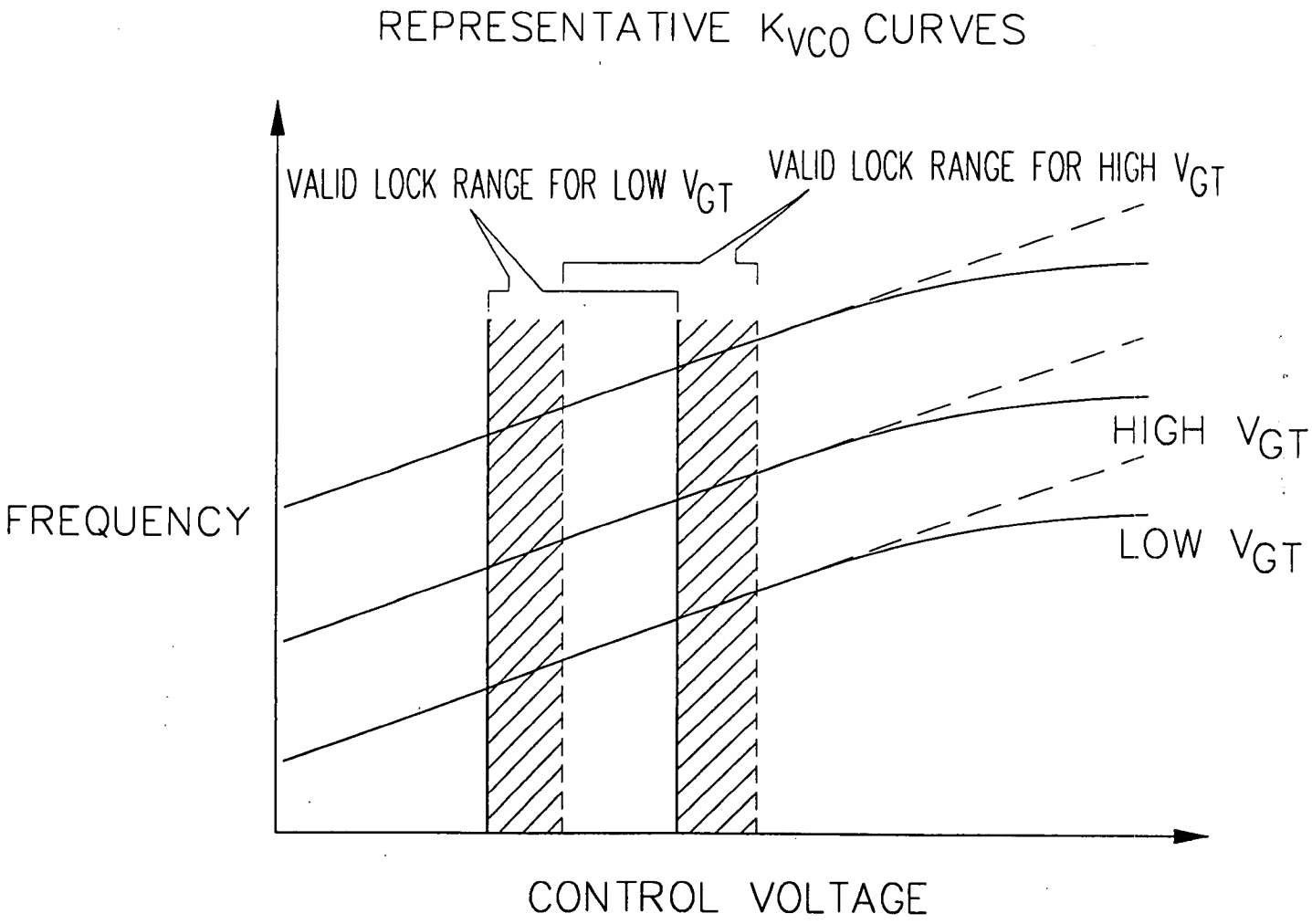


FIG. 48

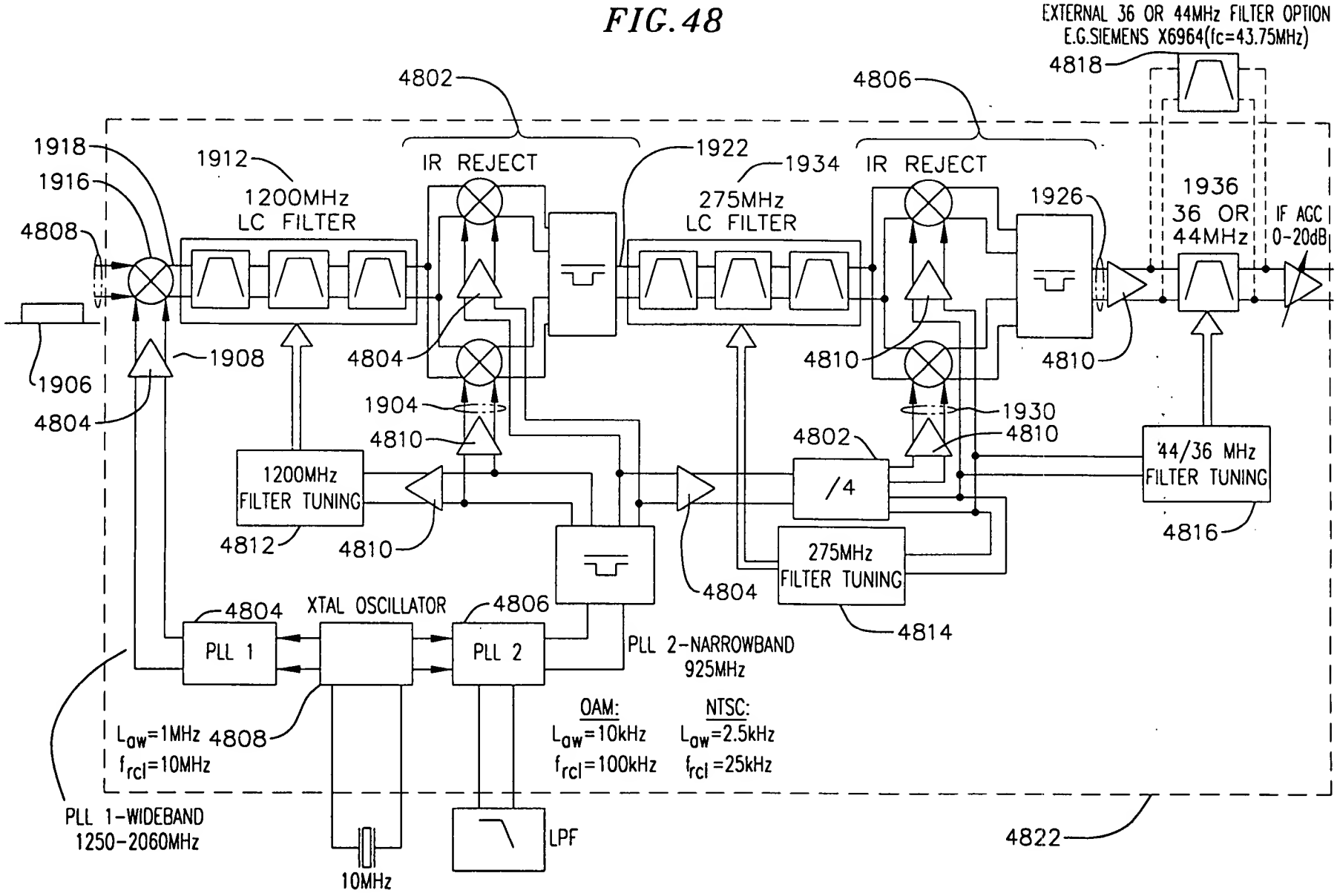

EXTERNAL 36 OR 44MHz FILTER OPTION
E.G.SIEMENS X6964(fc=43.75MHz)
4818
4802
4806
1918
1916
1912
1200MHz
LC FILTER
IR REJECT
1922
1934
275MHz
LC FILTER
IR REJECT
1926
1936
36 OR
44MHz
IF AGC
0-20dB
4808
1908
4804
1906
4804
4810
4810
1904
1930
4810
4802
1200MHz
FILTER TUNING
/4
44/36 MHz
FILTER TUNING
4812
4810
4816
275MHz
FILTER TUNING
4804
4814
4804
XTAL OSCILLATOR
4806
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
OAM:
NTSC:
L_{ow}=1MHz 4808
f_{rcl}=10MHz
L_{ow}=10kHz
f_{rcl}=100kHz
L_{ow}=2.5kHz
f_{rcl}=25kHz
PLL 1-WIDEBAND
1250-2060MHz
10MHz
LPF
4822

FIG.49

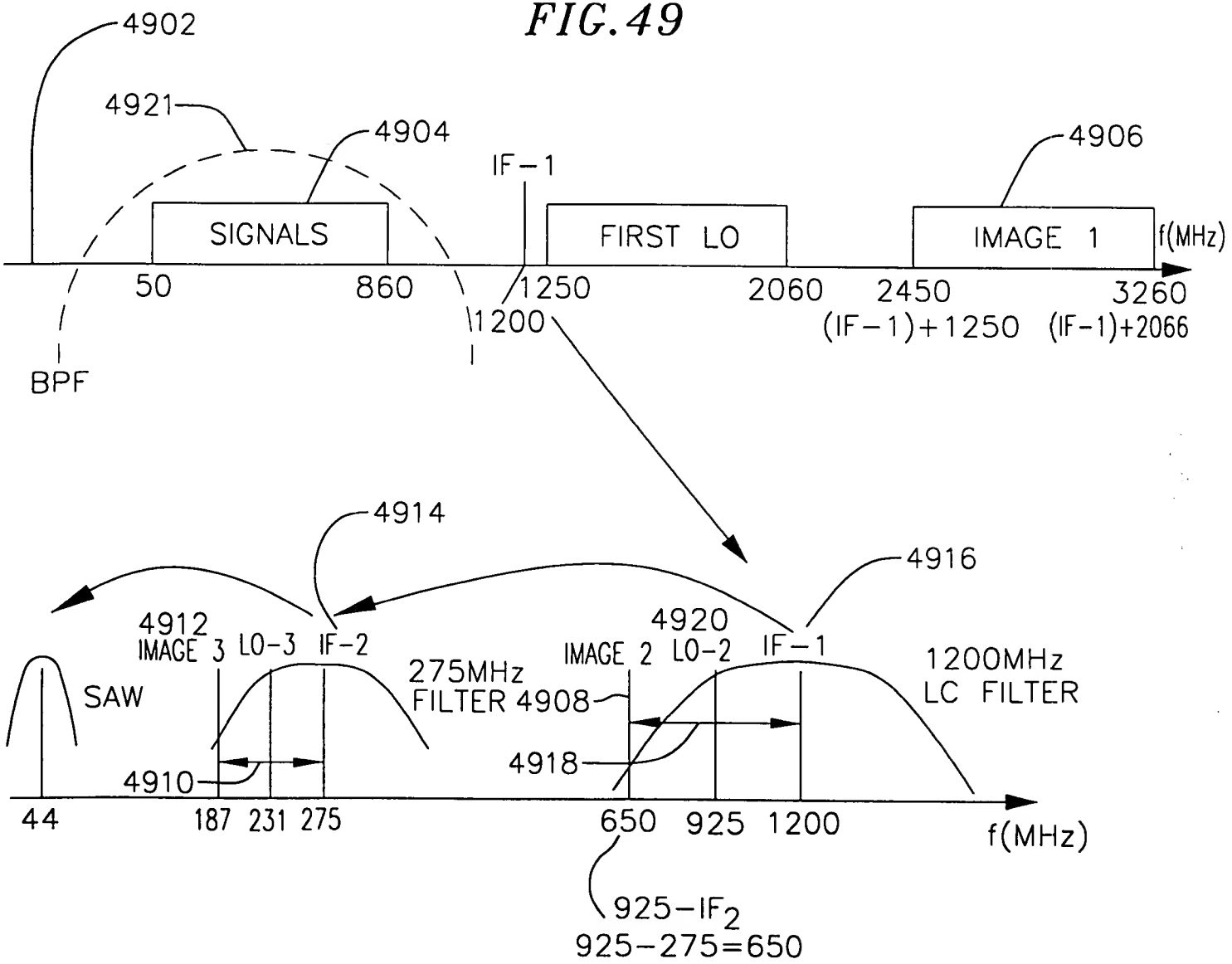

4902
4921
4904
IF-1
4906
SIGNALS
FIRST LO
IMAGE 1
f(MHz)
50
860
1250
2060
2450
3260
1200
(IF-1)+1250
(IF-1)+2066
BPF
4914
4916
4912
IMAGE 3 LO-3 IF-2
4920
IMAGE 2 LO-2 IF-1
SAW
275MHz
FILTER 4908
1200MHz
LC FILTER
4910
4918
44
187 231 275
650 925 1200
f(MHz)
925-IF2
925-275=650

FIG.50

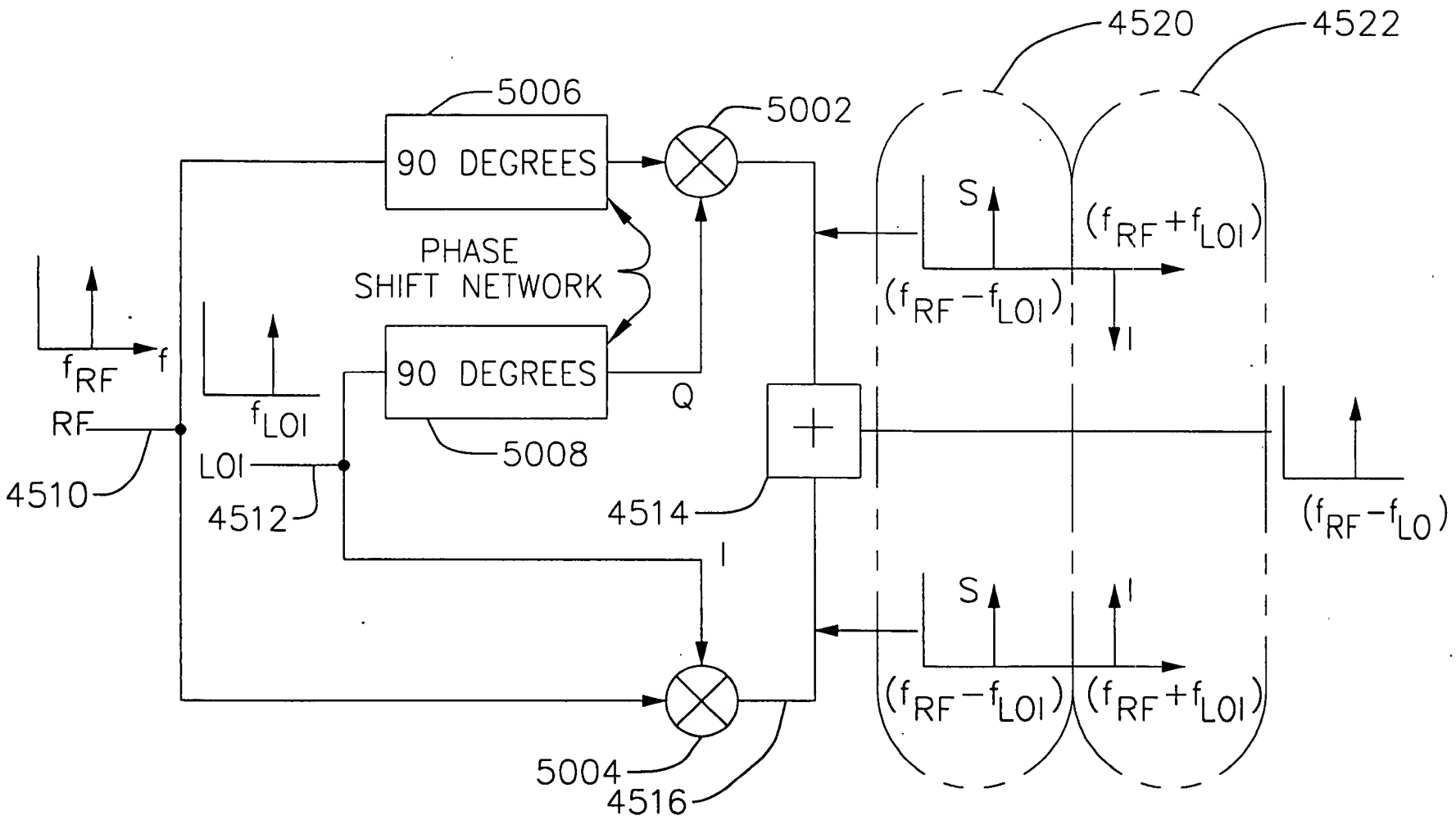

4520
4522
5006
5002
90 DEGREES
PHASE
SHIFT NETWORK
90 DEGREES
5008
Q
I
S
I
$(f_{RF}+f_{LOI})$
$(f_{RF}-f_{LOI})$
f_{RF}
f
RF
4510
f_{LOI}
LOI
4512
4514
$(f_{RF}-f_{LO})$
5004
4516

FIG.51

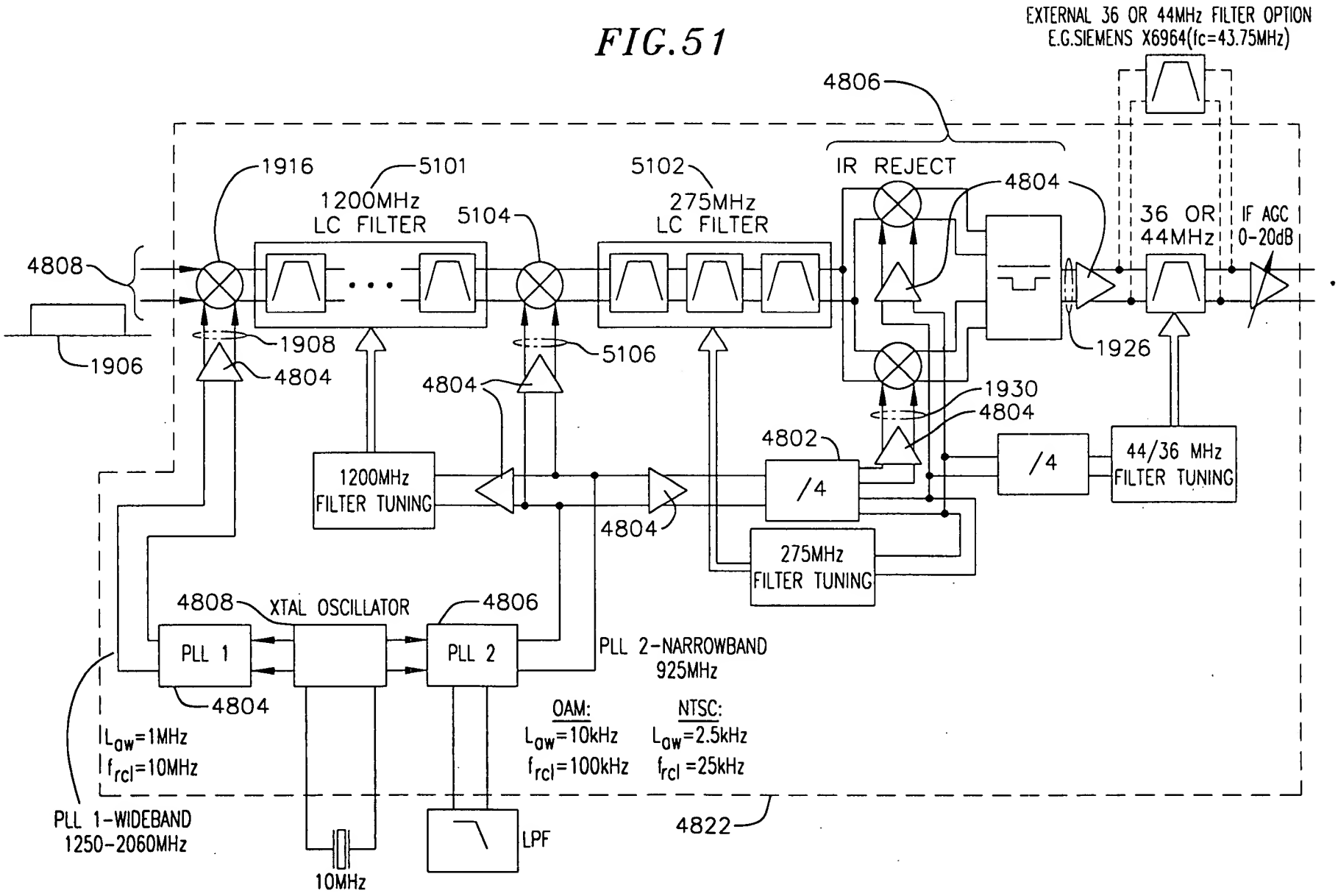

EXTERNAL 36 OR 44MHz FILTER OPTION
E.G.SIEMENS X6964(fc=43.75MHz)
4806
IR REJECT
1916
5101
1200MHz
LC FILTER
5104
5102
275MHz
LC FILTER
4804
36 OR
44MHz
IF ACC
0-20dB
4808
1906
1908
4804
5106
1926
4804
1930
4804
4802
/4
44/36 MHz
FILTER TUNING
1200MHz
FILTER TUNING
4804
275MHz
FILTER TUNING
4808
XTAL OSCILLATOR
4806
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
4804
OAM:
L_{ow}=10kHz
f_{rcl}=100kHz
NTSC:
L_{ow}=2.5kHz
f_{rcl} =25kHz
L_{ow}=1MHz
f_{rcl}=10MHz
PLL 1-WIDEBAND
1250-2060MHz
4822
LPF
10MHz

FIG.52

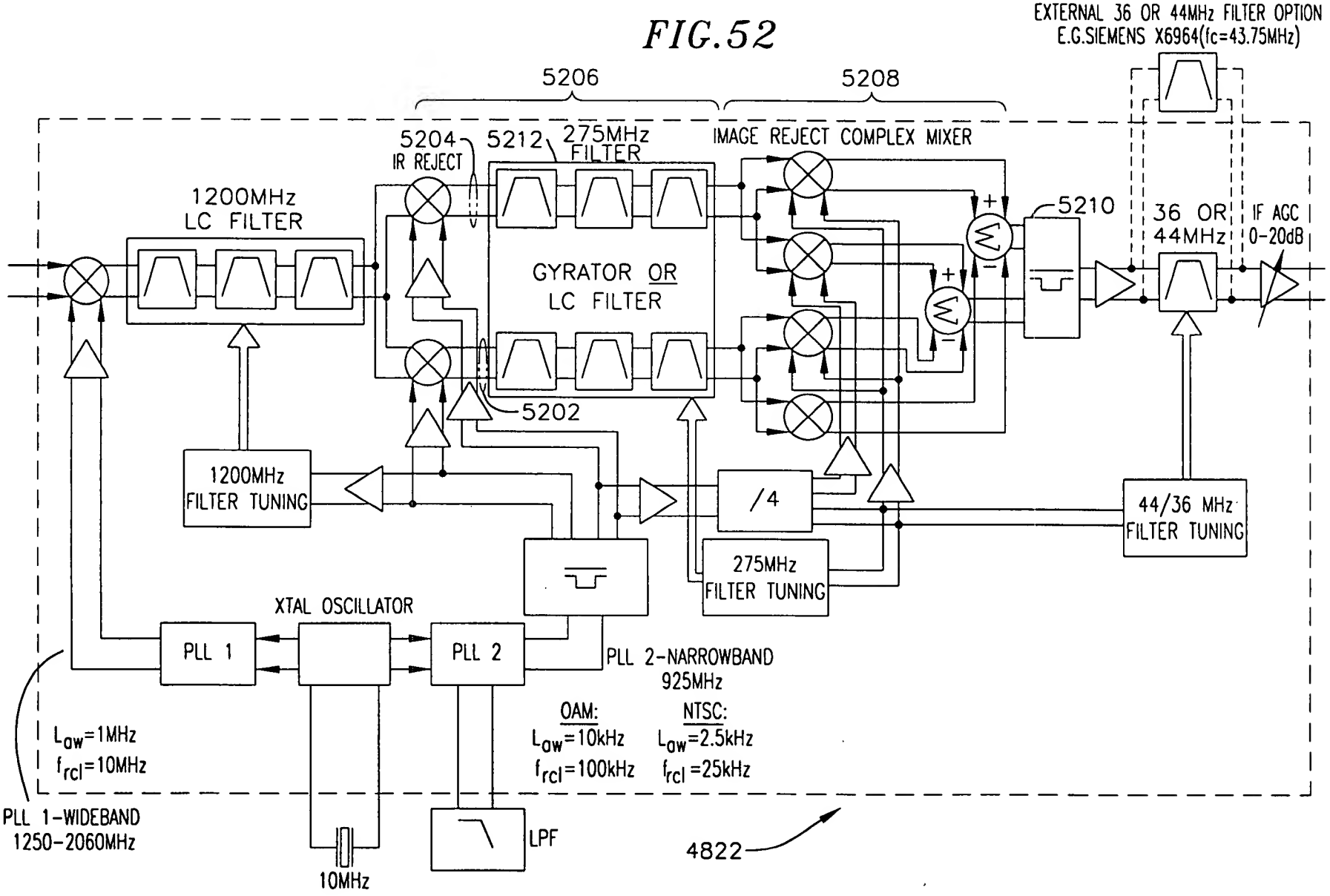

EXTERNAL 36 OR 44MHz FILTER OPTION
E.G.SIEMENS X6964(fc=43.75MHz)
5206
5208
5204
IR REJECT
5212
275MHz
FILTER
IMAGE REJECT COMPLEX MIXER
1200MHz
LC FILTER
GYRATOR OR
LC FILTER
5210
36 OR
44MHz
IF AGC
0-20dB
5202
1200MHz
FILTER TUNING
/4
44/36 MHz
FILTER TUNING
275MHz
FILTER TUNING
XTAL OSCILLATOR
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
OAM:
L_{ow}=10kHz
f_{rcl}=100kHz
NTSC:
L_{ow}=2.5kHz
f_{rcl}=25kHz
L_{ow}=1MHz
f_{rcl}=10MHz
PLL 1-WIDEBAND
1250-2060MHz
10MHz
LPF
4822

FIG.53

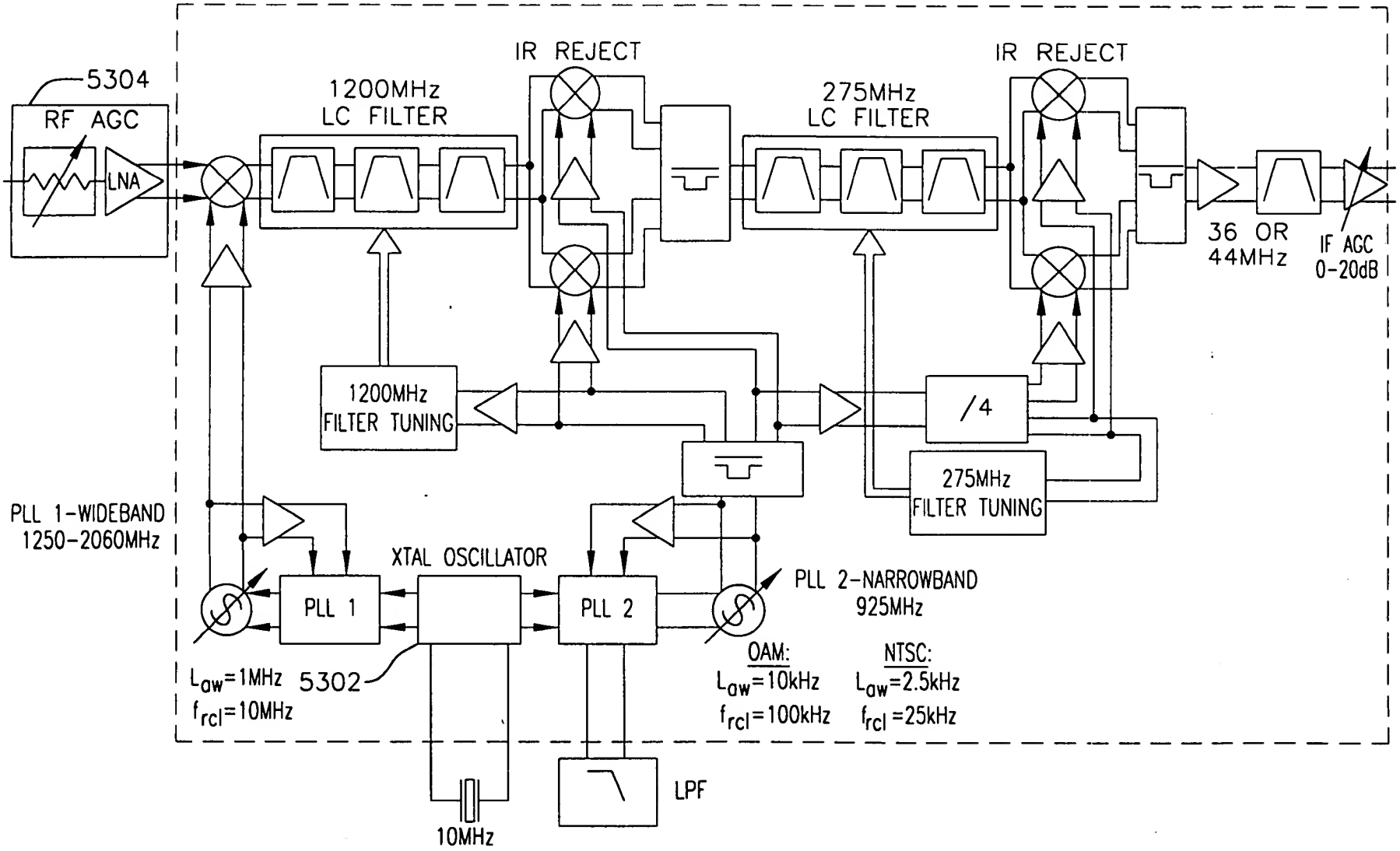

CATV TUNER
5304
RF AGC
LNA
1200MHz
LC FILTER
IR REJECT
275MHz
LC FILTER
IR REJECT
36 OR
44MHz
IF AGC
0-20dB
1200MHz
FILTER TUNING
/4
275MHz
FILTER TUNING
PLL 1-WIDEBAND
1250-2060MHz
XTAL OSCILLATOR
PLL 1
PLL 2
PLL 2-NARROWBAND
925MHz
OAM:
L_{aw}=10kHz
f_{rcl}=100kHz
NTSC:
L_{aw}=2.5kHz
f_{rcl}=25kHz
L_{aw}=1MHz
f_{rcl}=10MHz
5302
10MHz
LPF

FIG.54

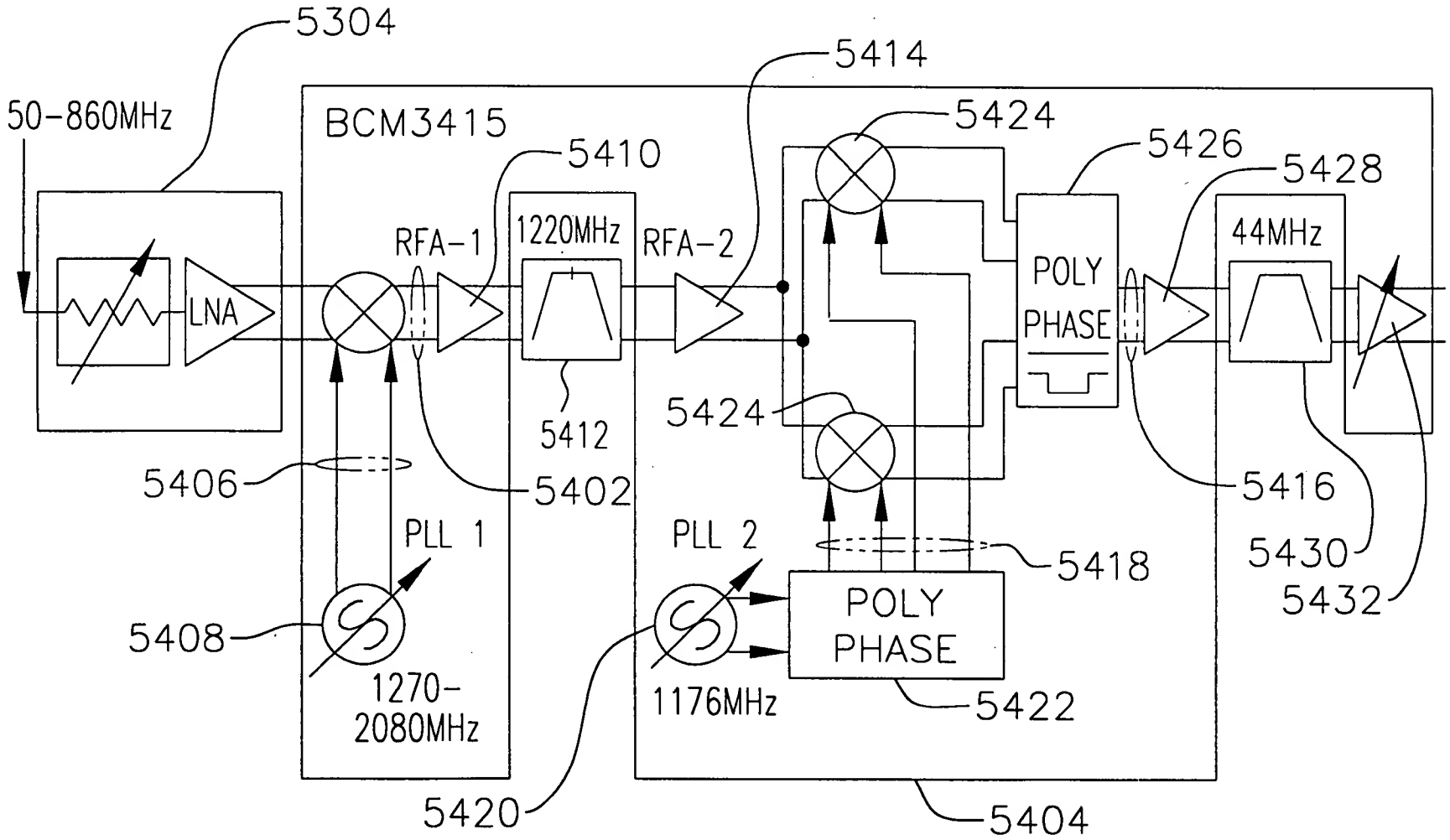
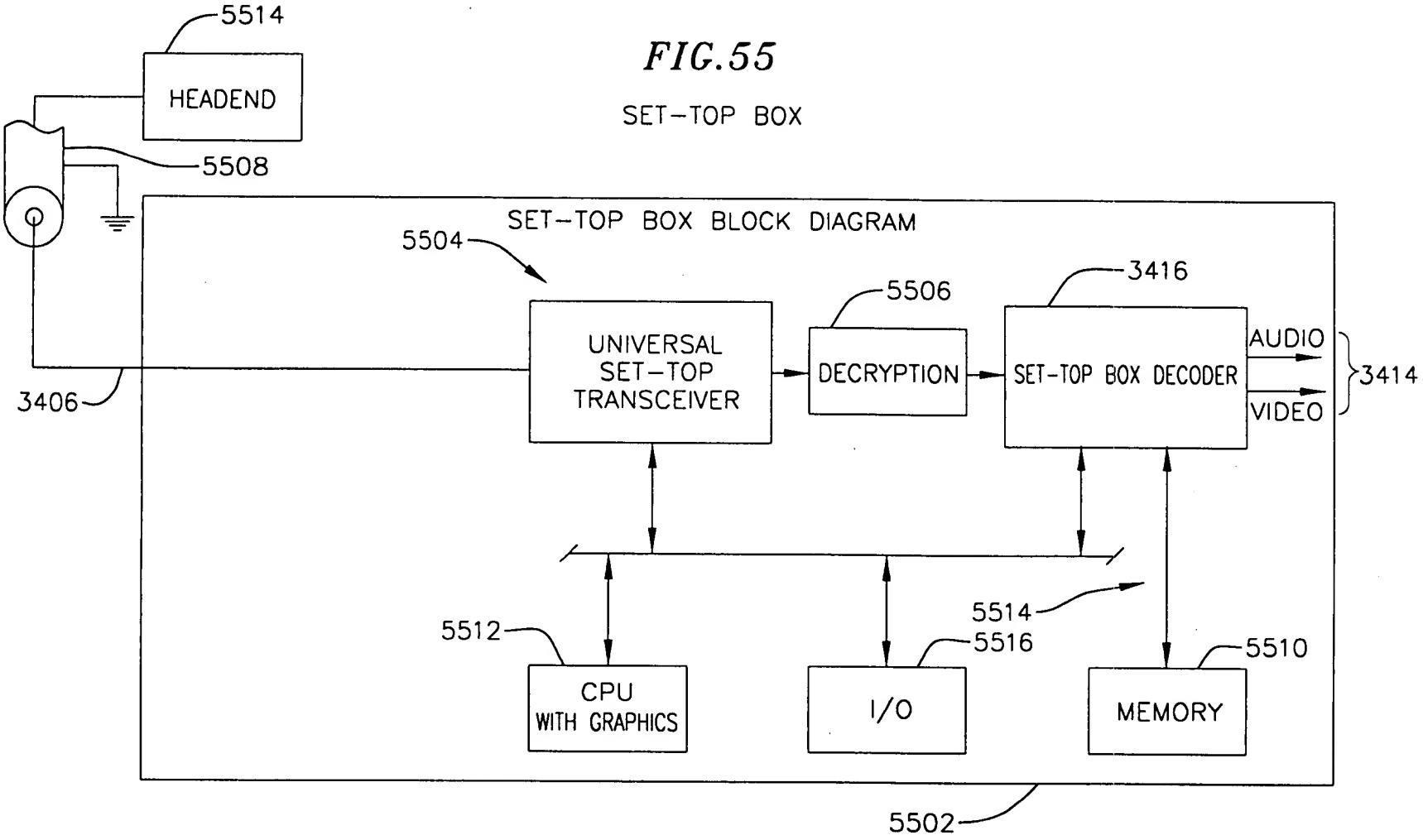

5304
50-860MHz
BCM3415
5414
5424
5410
5426
5428
RFA-1
1220MHz
RFA-2
POLY
PHASE
44MHz
LNA
5412
5424
5406
5402
5416
PLL 1
PLL 2
5418
5430
5432
5408
POLY
PHASE
1270-
2080MHz
1176MHz
5422
5420
5404

FIG.55

SET-TOP BOX



US6121926A

FIG.56

TELEVISION

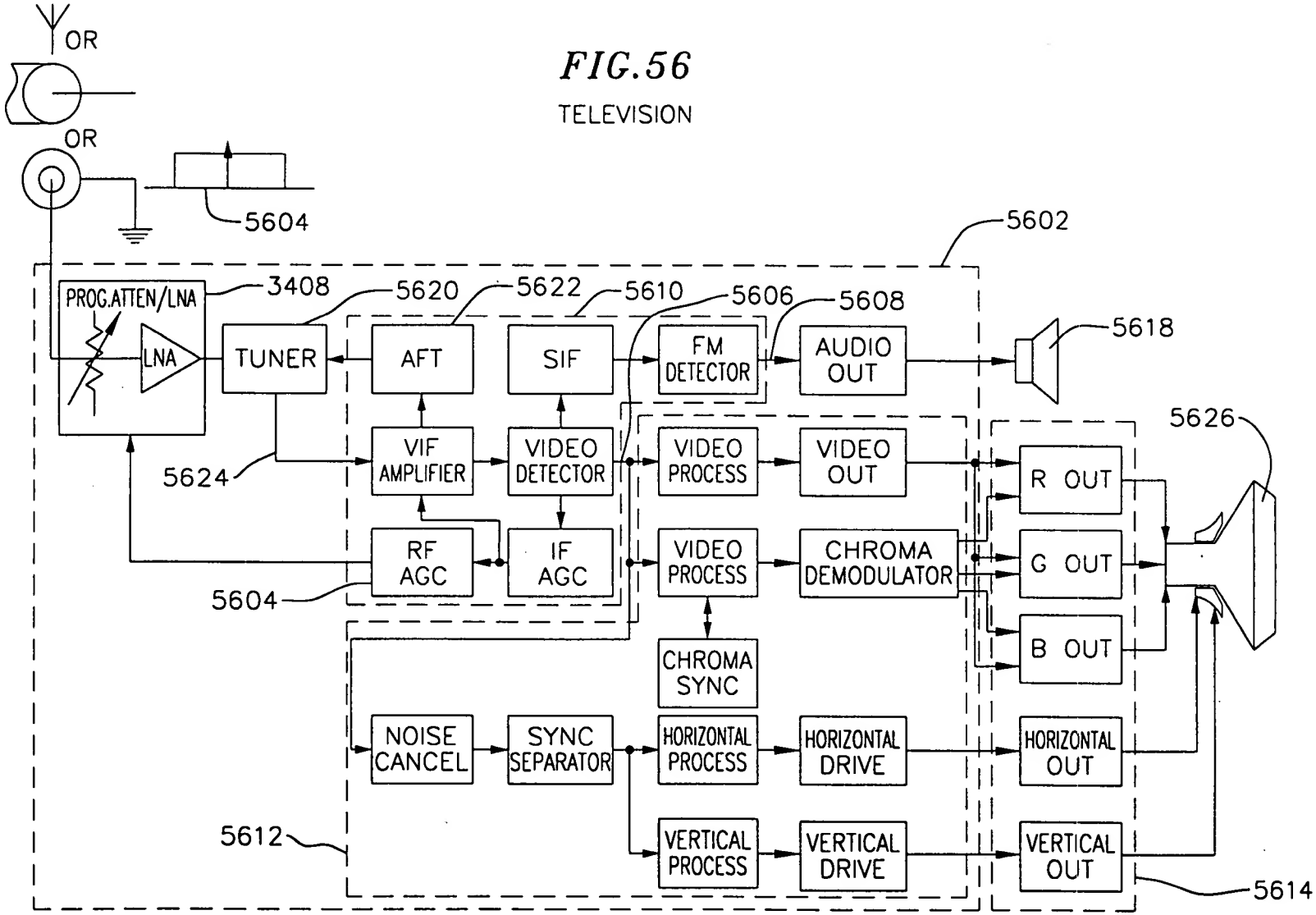
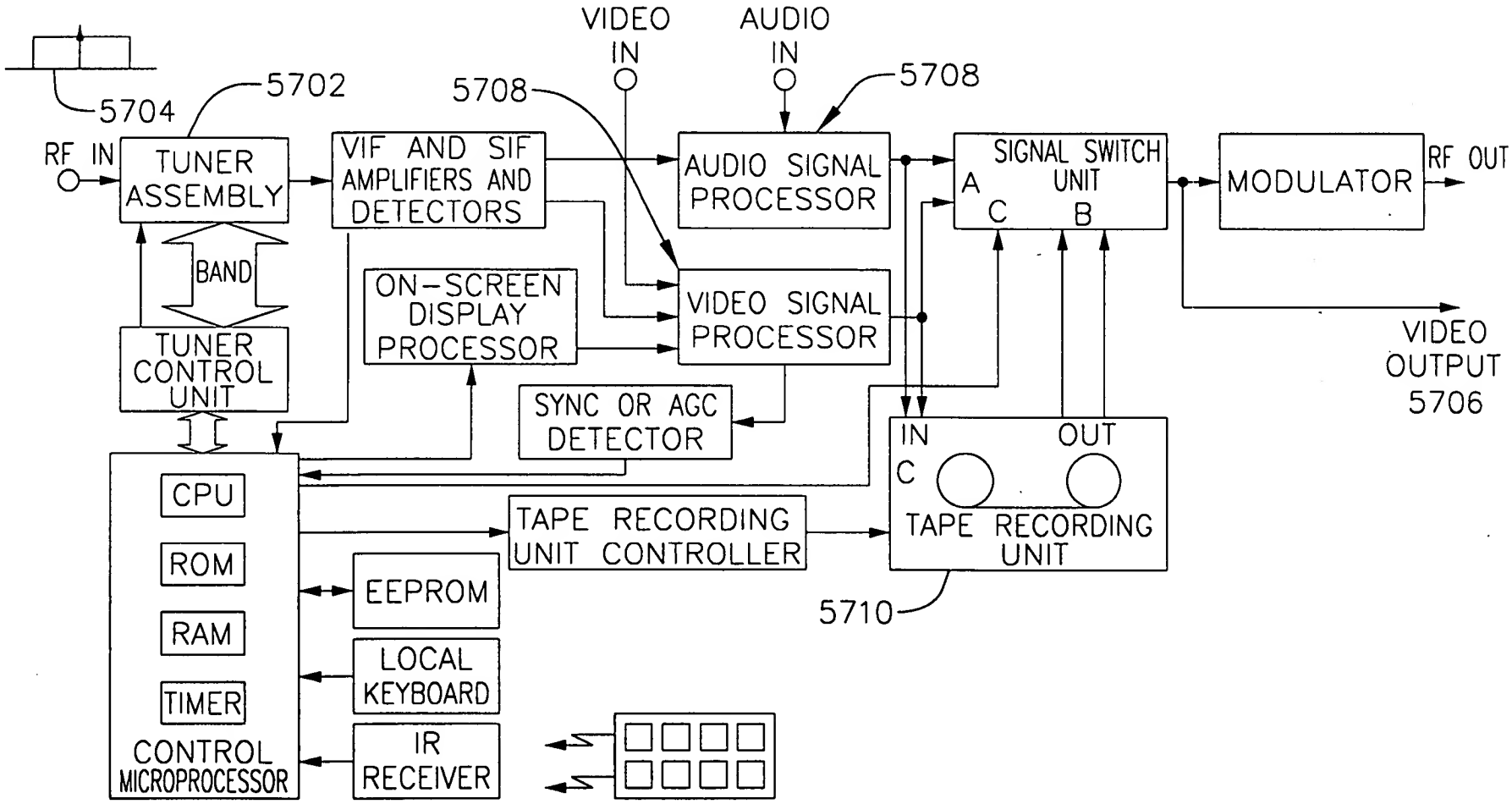


FIG.57

VCR BLOCK DIAGRAM



Docket One2Cab

FIG.58

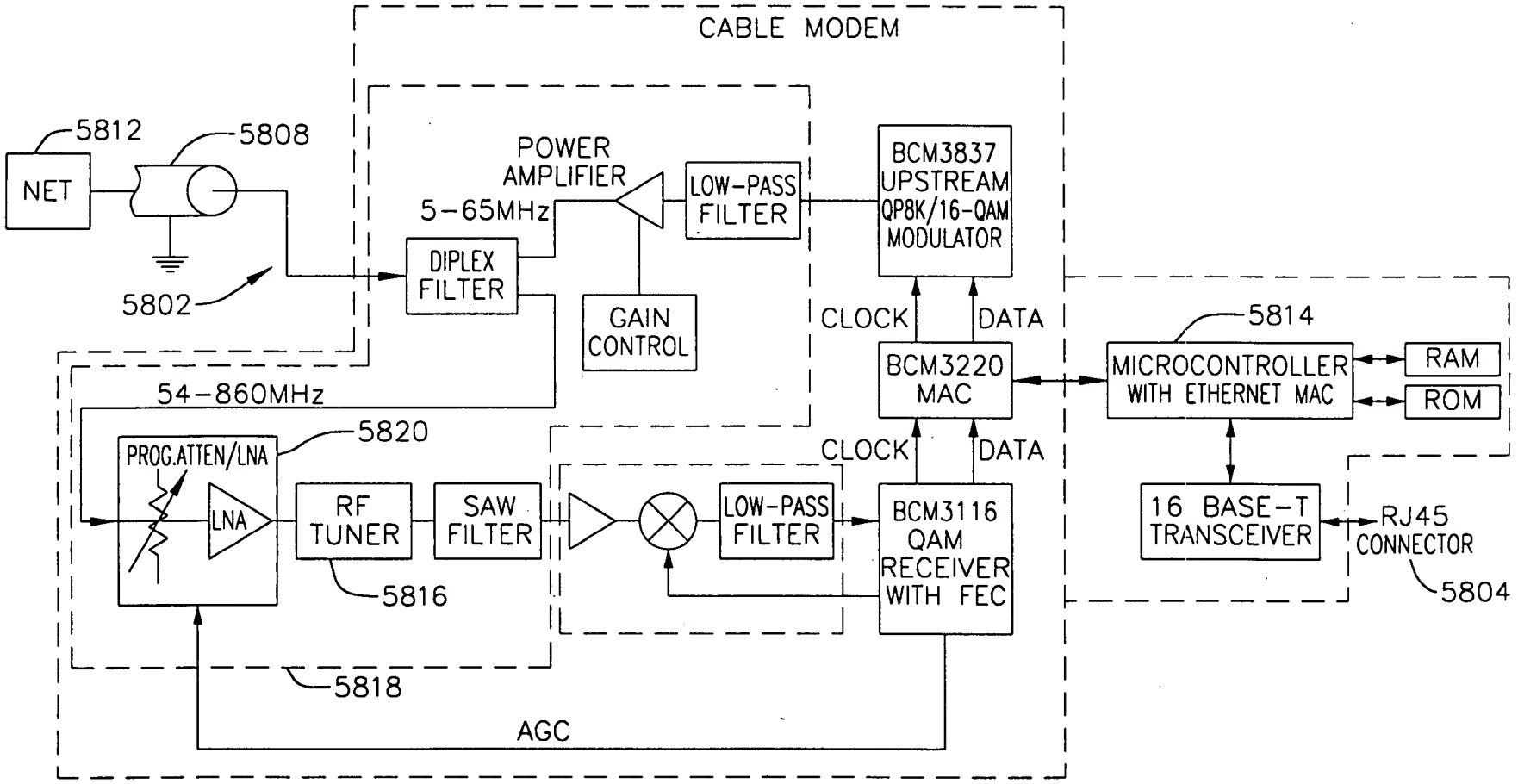


FIG.59

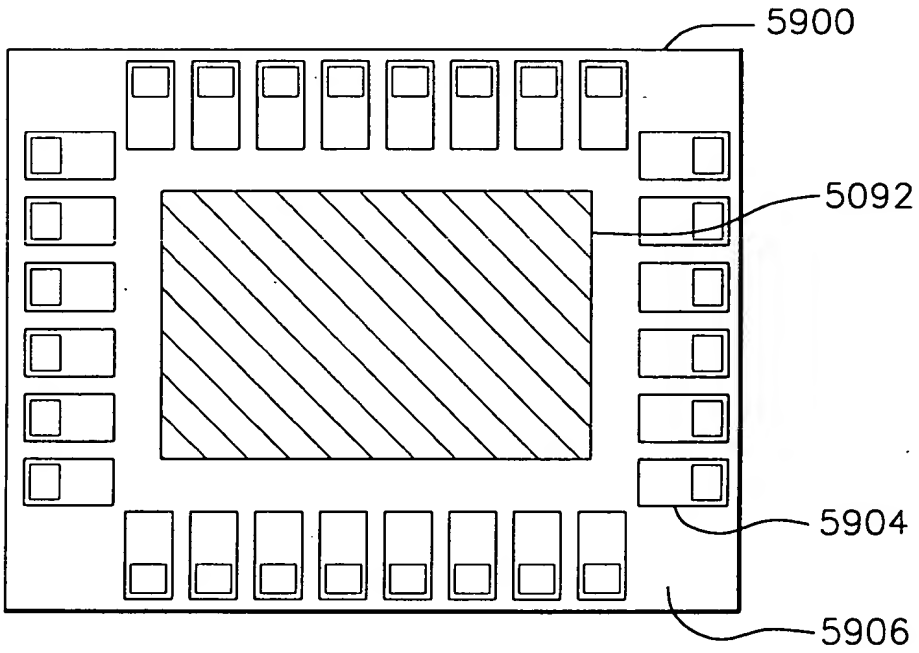


FIG.60

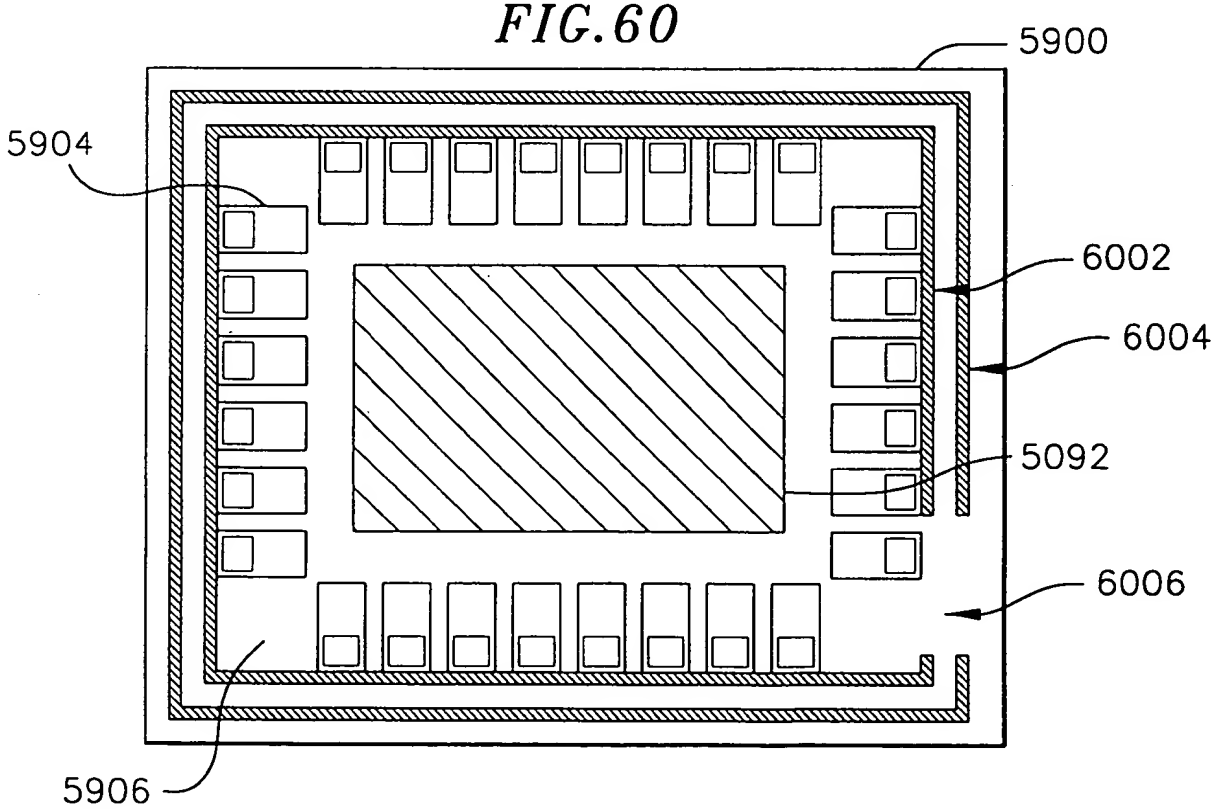


FIG.61

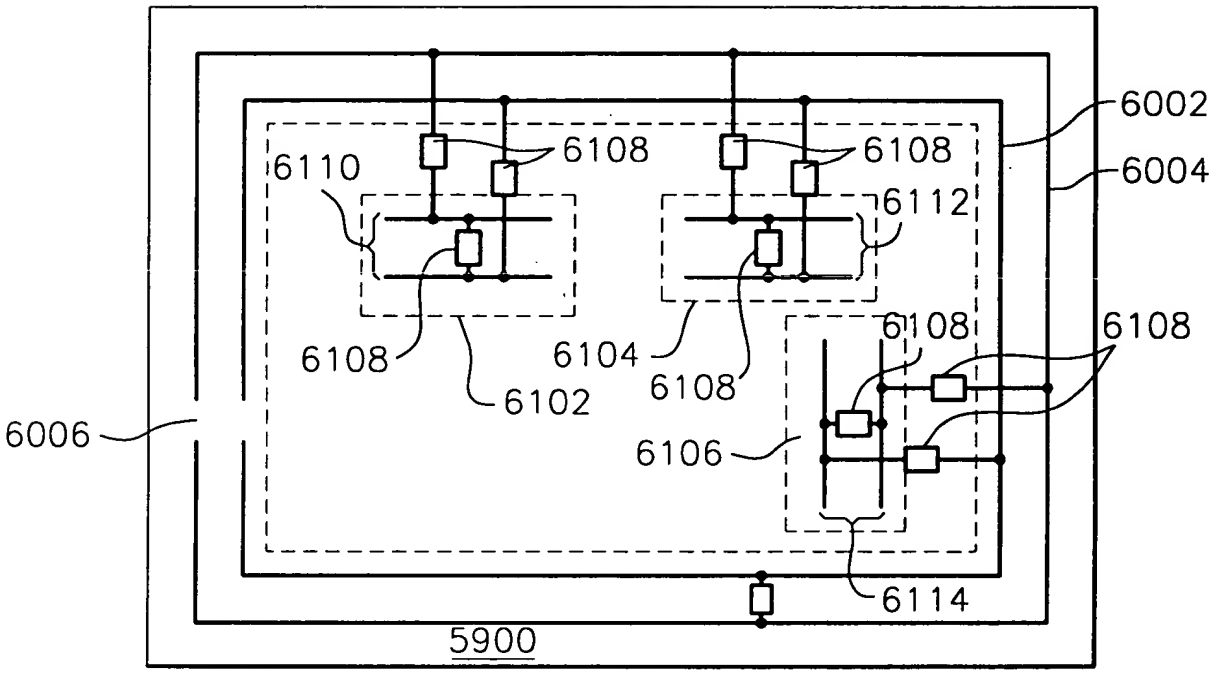

6002
6004
6110
6108
6108
6112
6108
6108
6104
6108
6102
6108
6006
6106
6114
5900

FIG.62

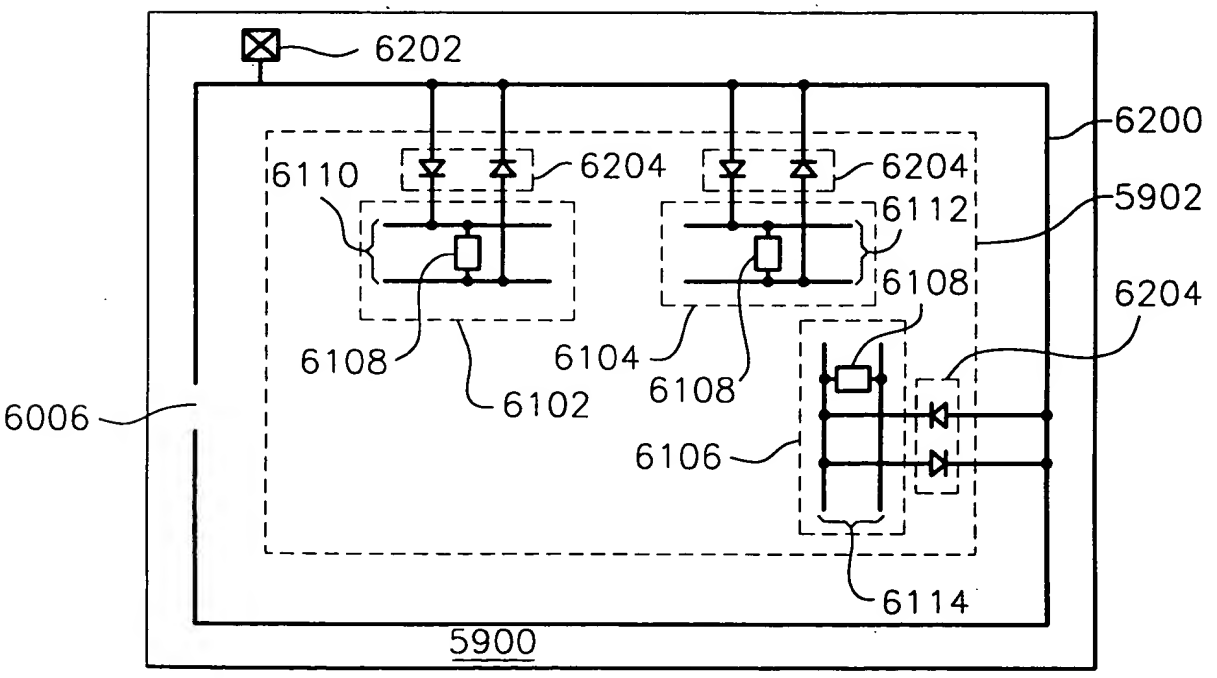

6202
6200
6110
6204
6204
5902
6112
6108
6204
6104
6108
6102
6108
6006
6106
6114
5900

FIG. 63

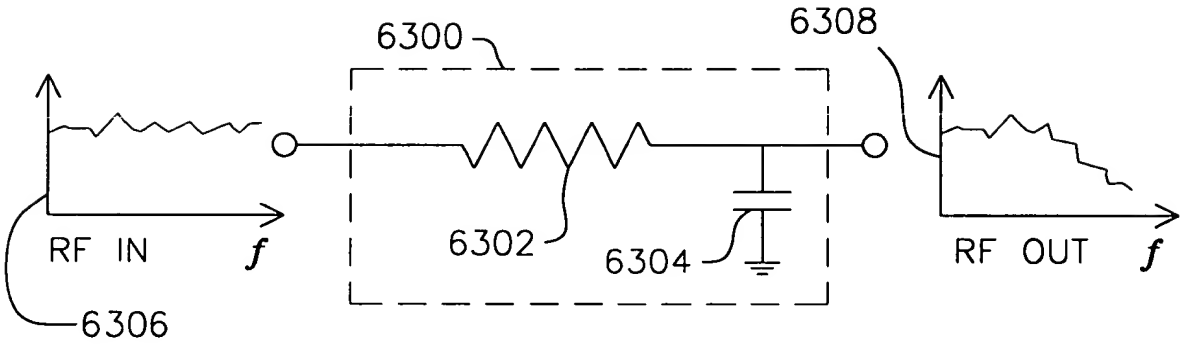


FIG. 64

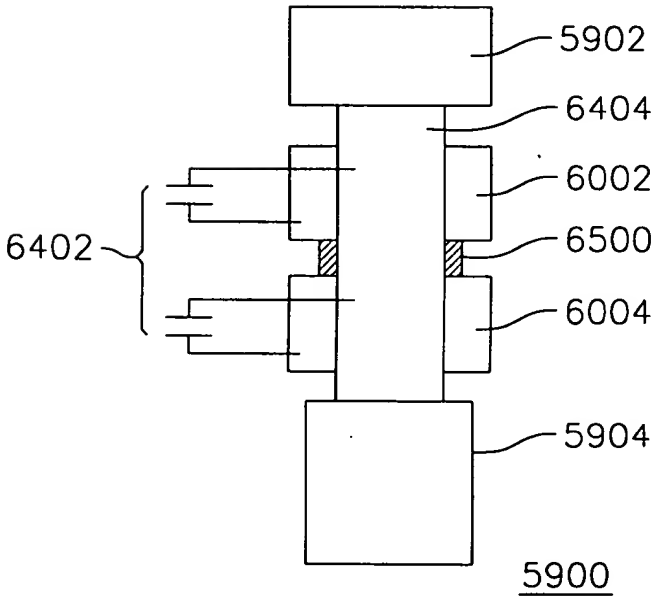


FIG. 65

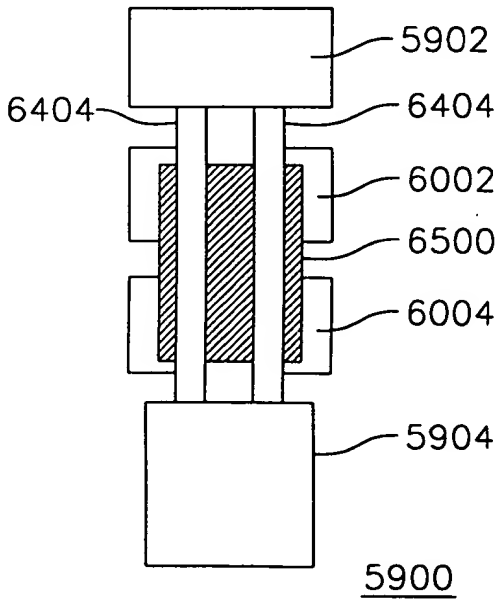


FIG. 66

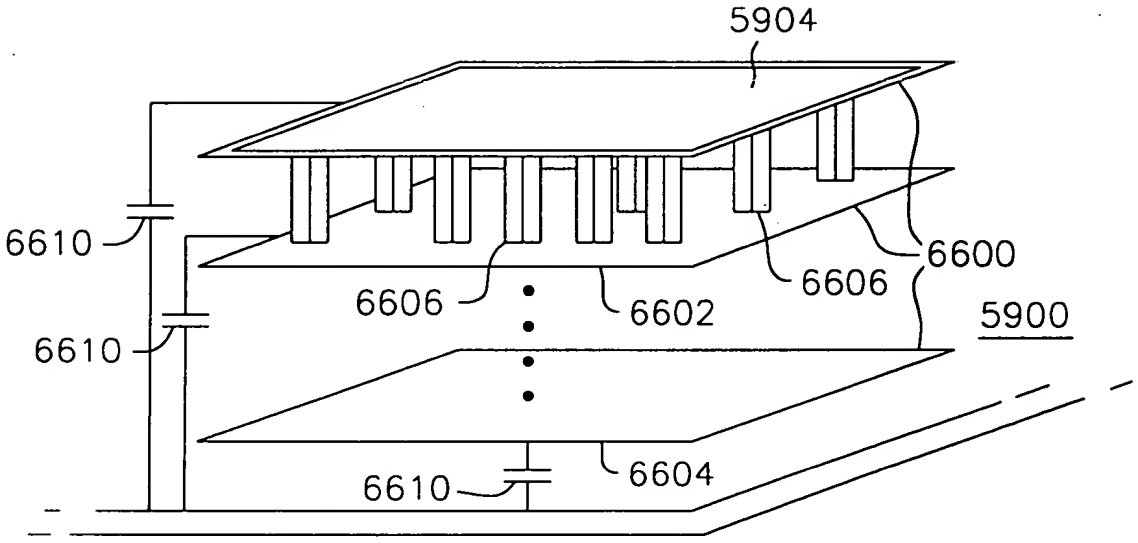

5904
6610
6610
6606
6602
6606
6600
5900
6610
6604

FIG. 67

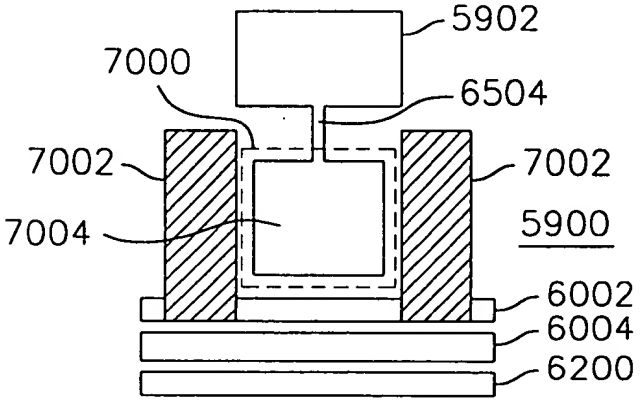

5902
7000
6504
7002
7002
7004
5900
6002
6004
6200

FIG.68

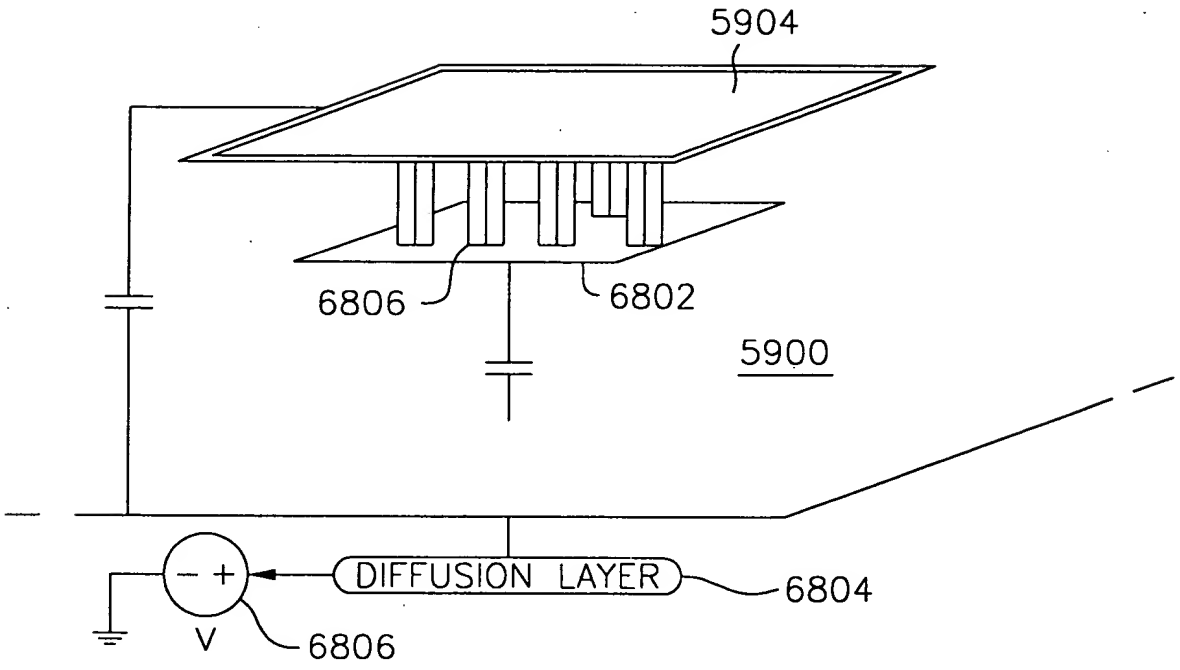


FIG.69a
PRIOR ART

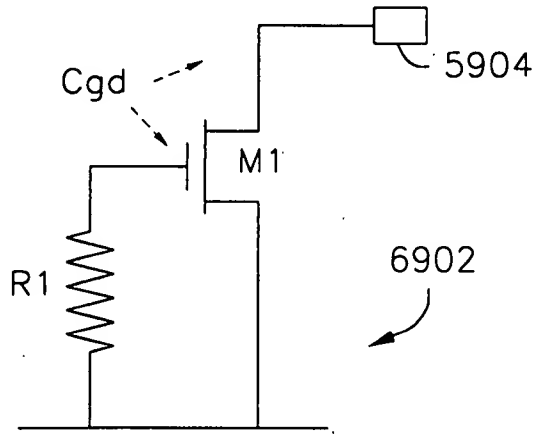


FIG.69b
PRIOR ART

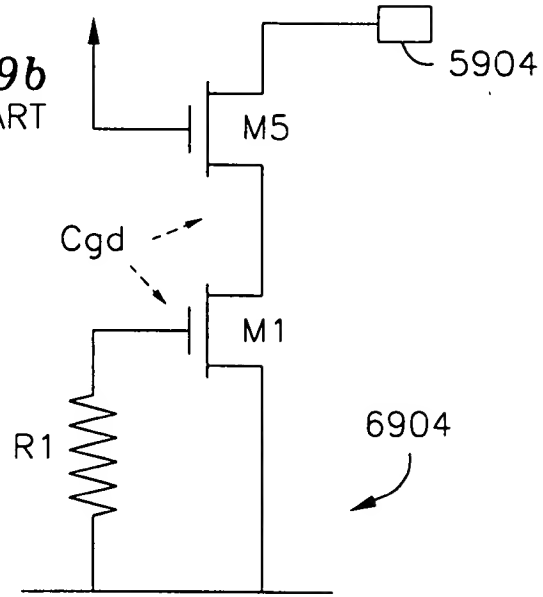


FIG.69c
PRIOR ART

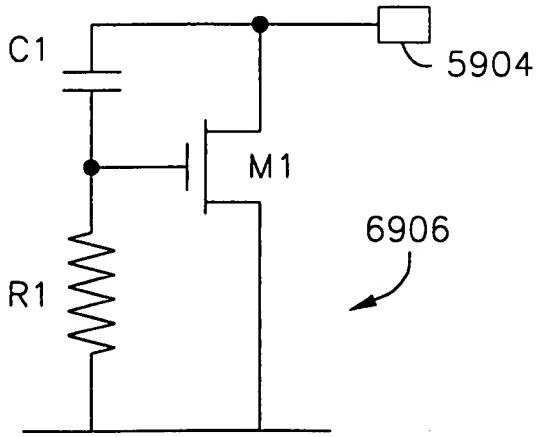


FIG.69d
PRIOR ART

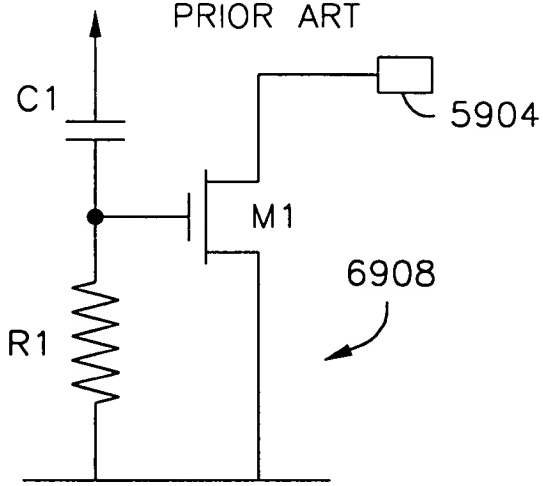


FIG.69e
PRIOR ART

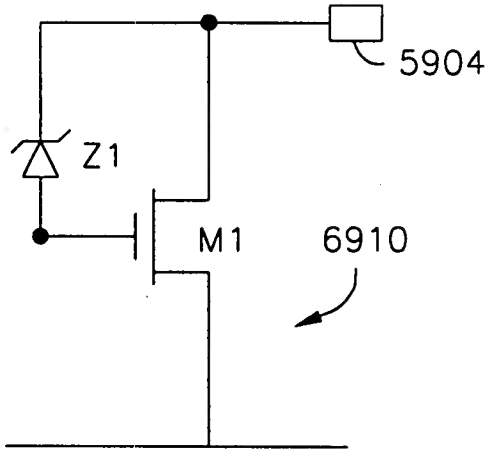


FIG. 70

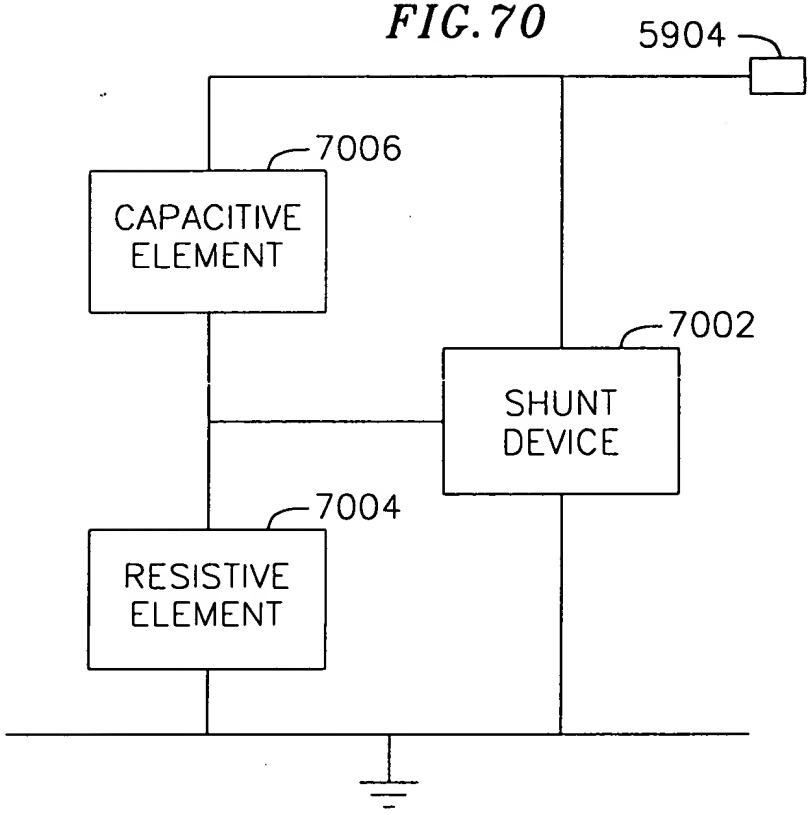

5904
7006
CAPACITIVE ELEMENT
7002
SHUNT DEVICE
7004
RESISTIVE ELEMENT

FIG. 71

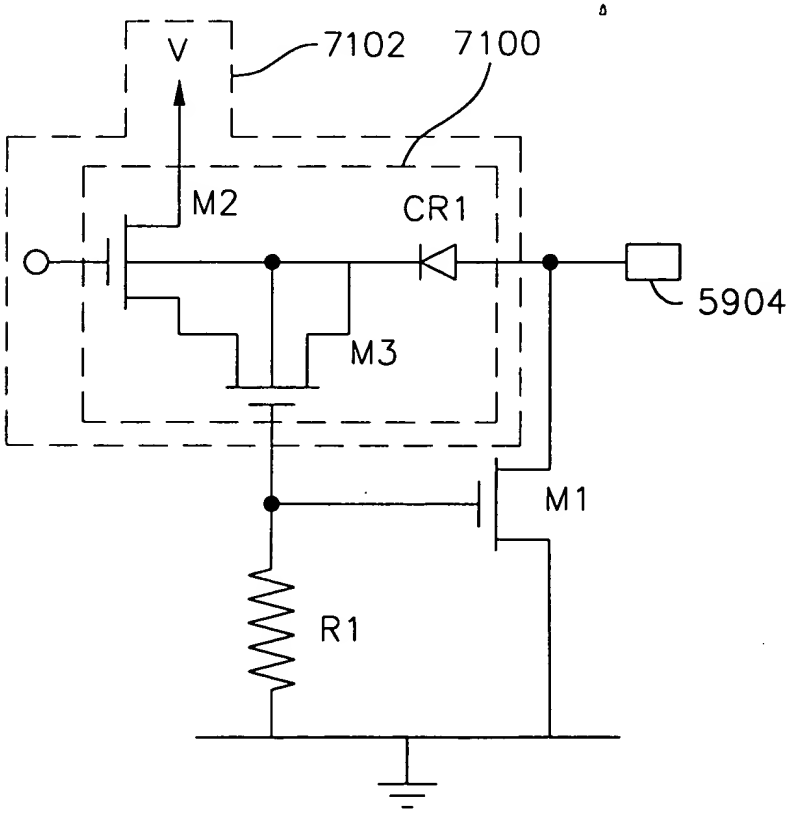

V
7102
7100
M2
CR1
5904
M3
M1
R1

FIG. 72

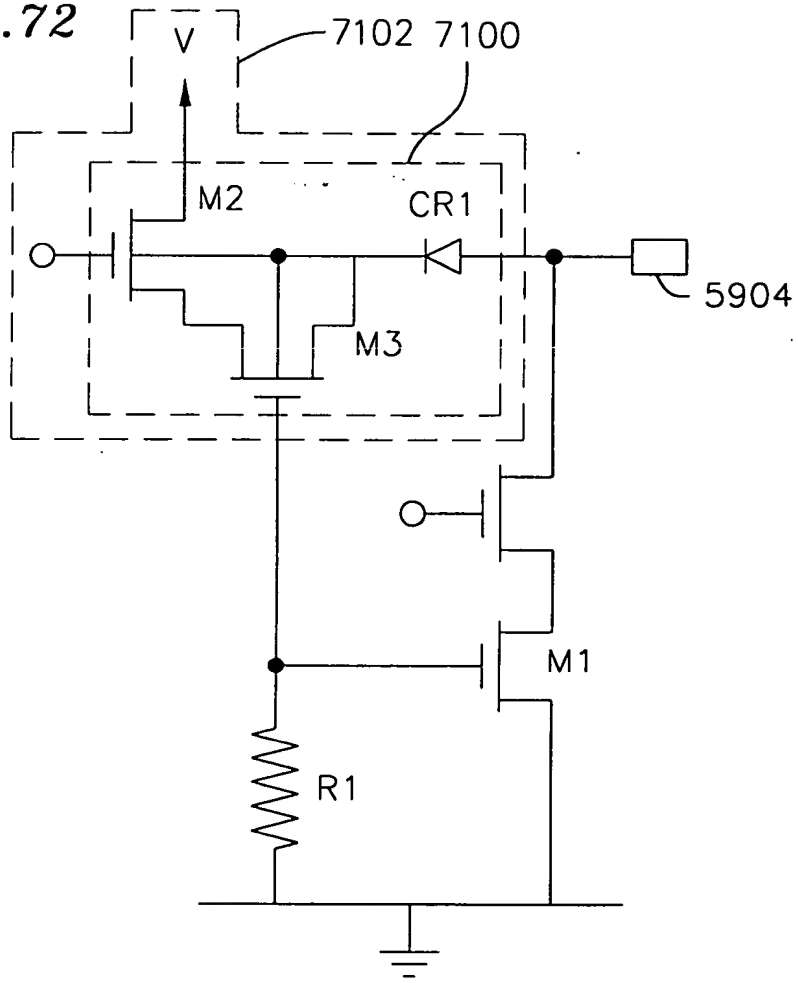
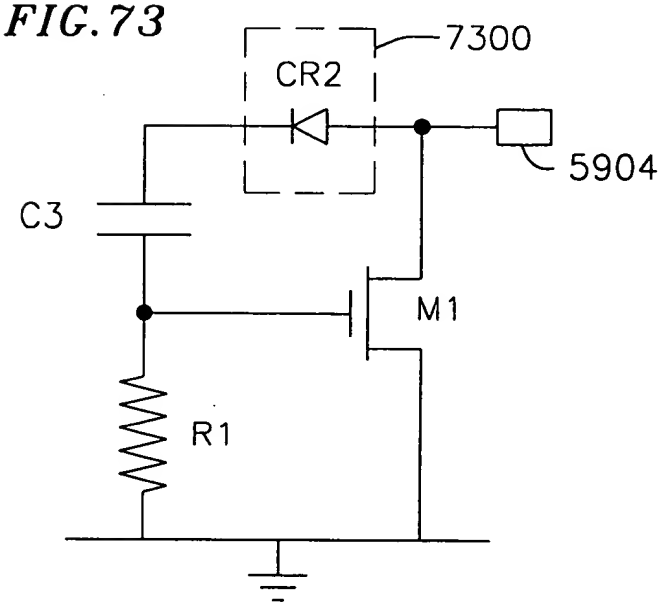
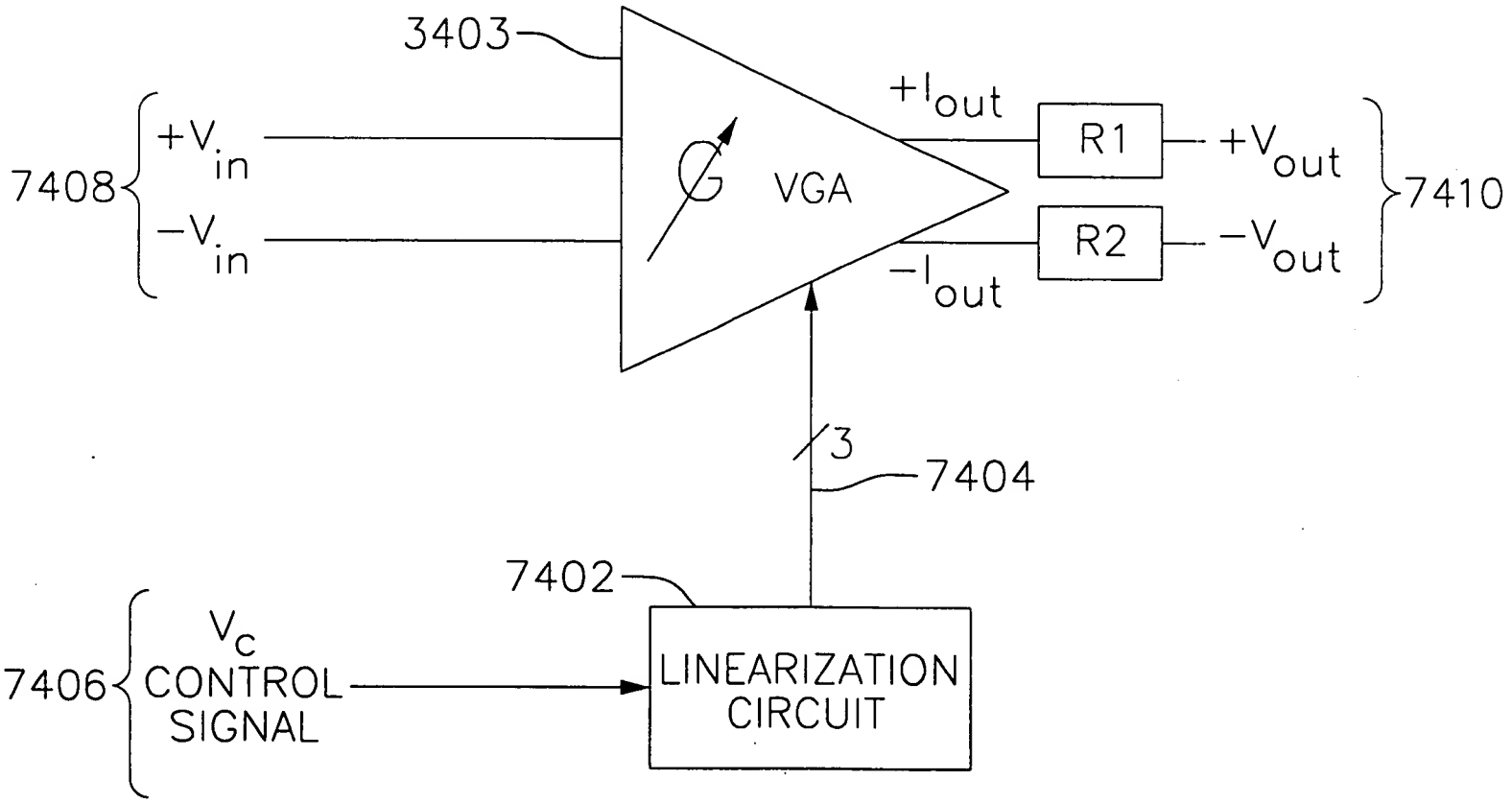


FIG. 73



DOCKET ONE2200

FIG.74



0054E-0702E20

FIG. 75

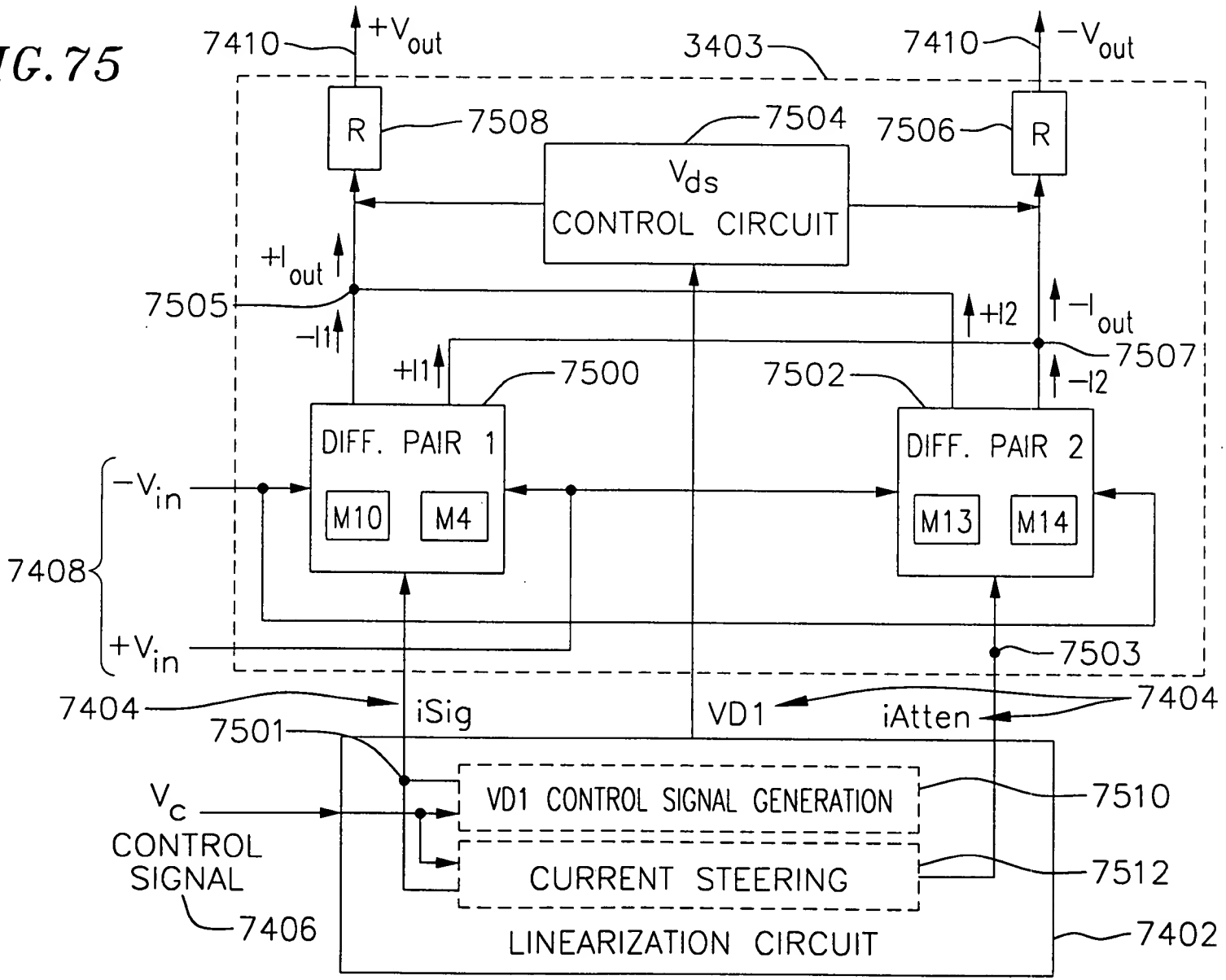


FIG. 76

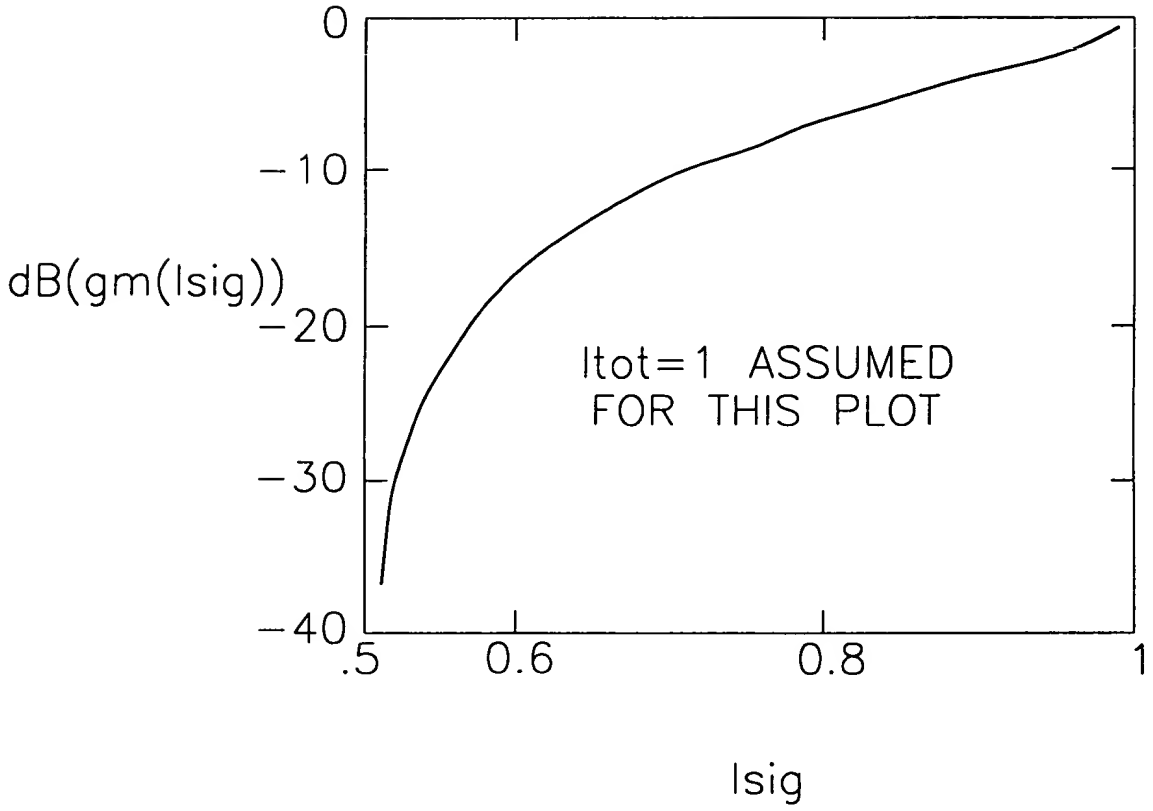

0
−10
−20
−30
−40
dB(gm(Isig))
.5
0.6
0.8
1
Itot=1 ASSUMED
FOR THIS PLOT
Isig

FIG. 77

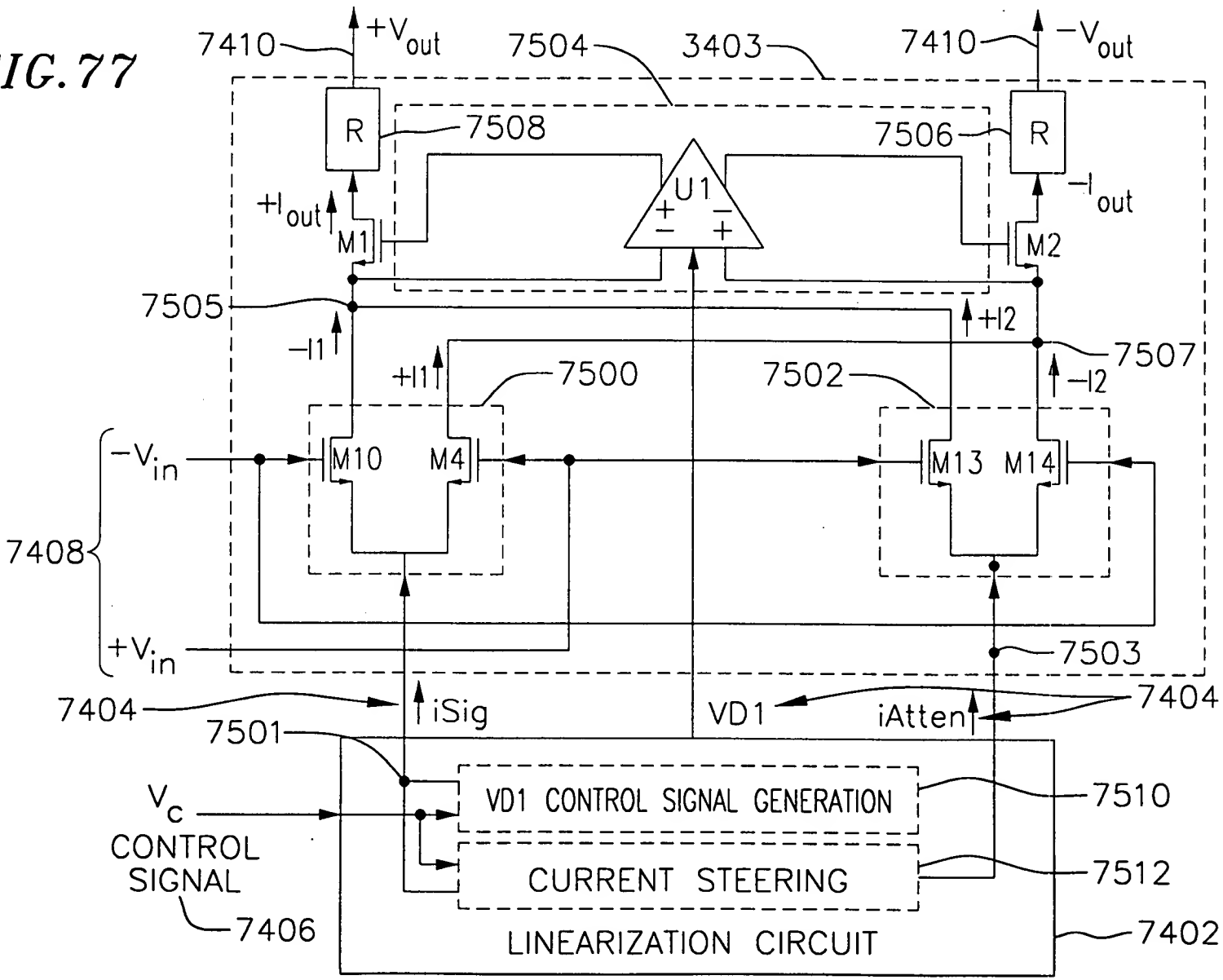

7410
+Vout
7504
3403
7410
−Vout
R
7508
7506
R
U1
+Iout
M1
M2
−Iout
7505
+I2
−I1
+I1
7500
7502
7507
−I2
−Vin
M10
M4
M13
M14
7408
+Vin
7503
7404
iSig
VD1
iAtten
7404
7501
Vc
CONTROL SIGNAL
7406
VD1 CONTROL SIGNAL GENERATION
7510
CURRENT STEERING
7512
LINEARIZATION CIRCUIT
7402

FIG.78a

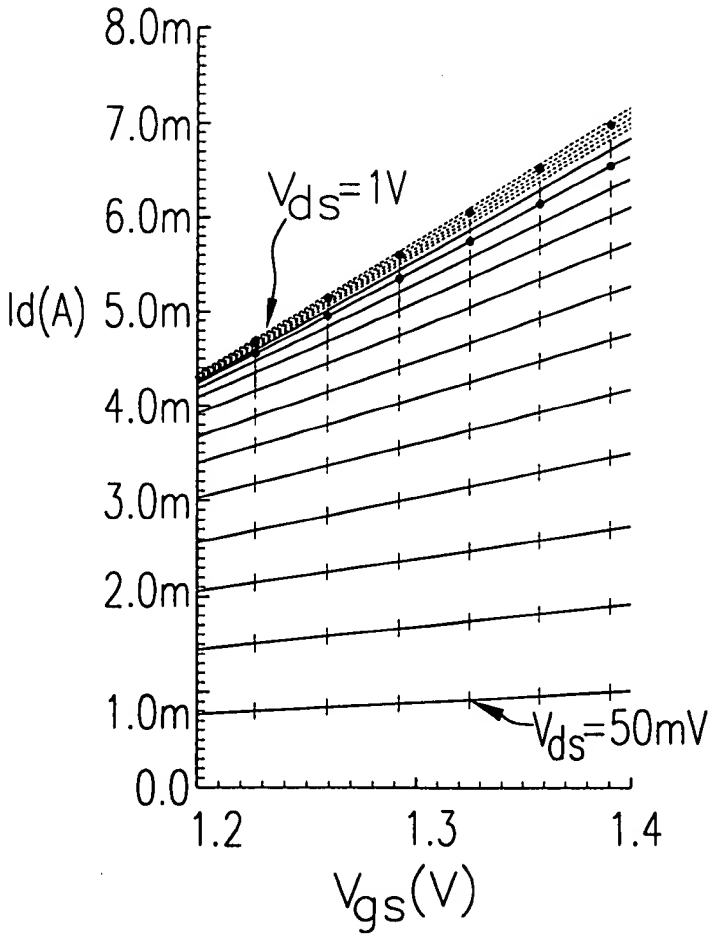


FIG.78b

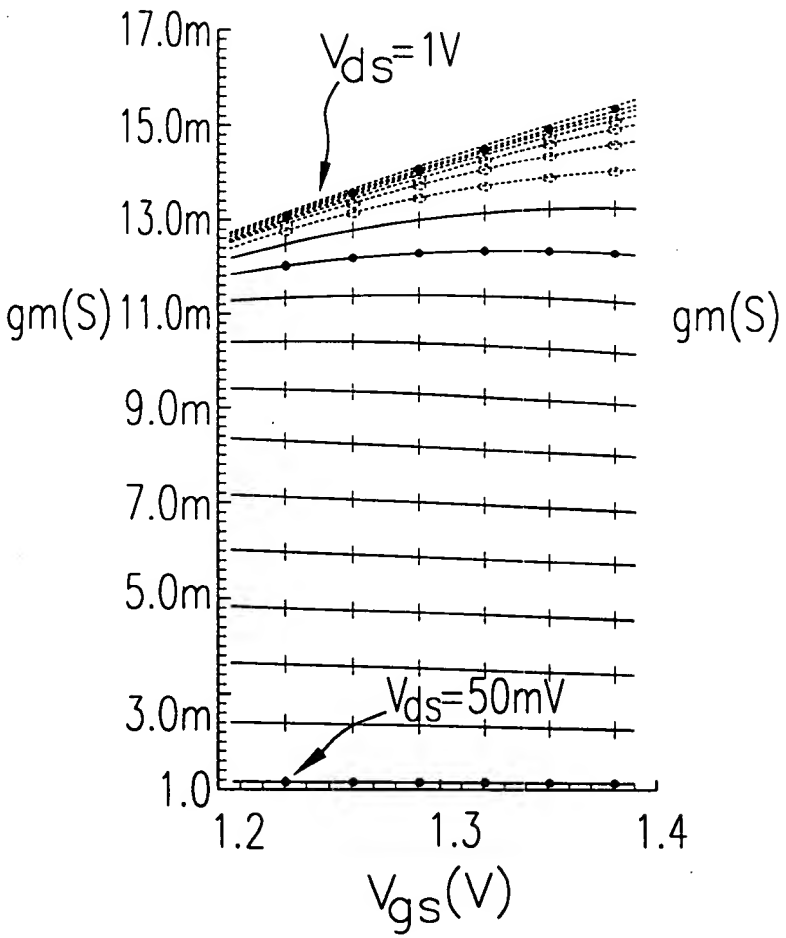


FIG. 78c

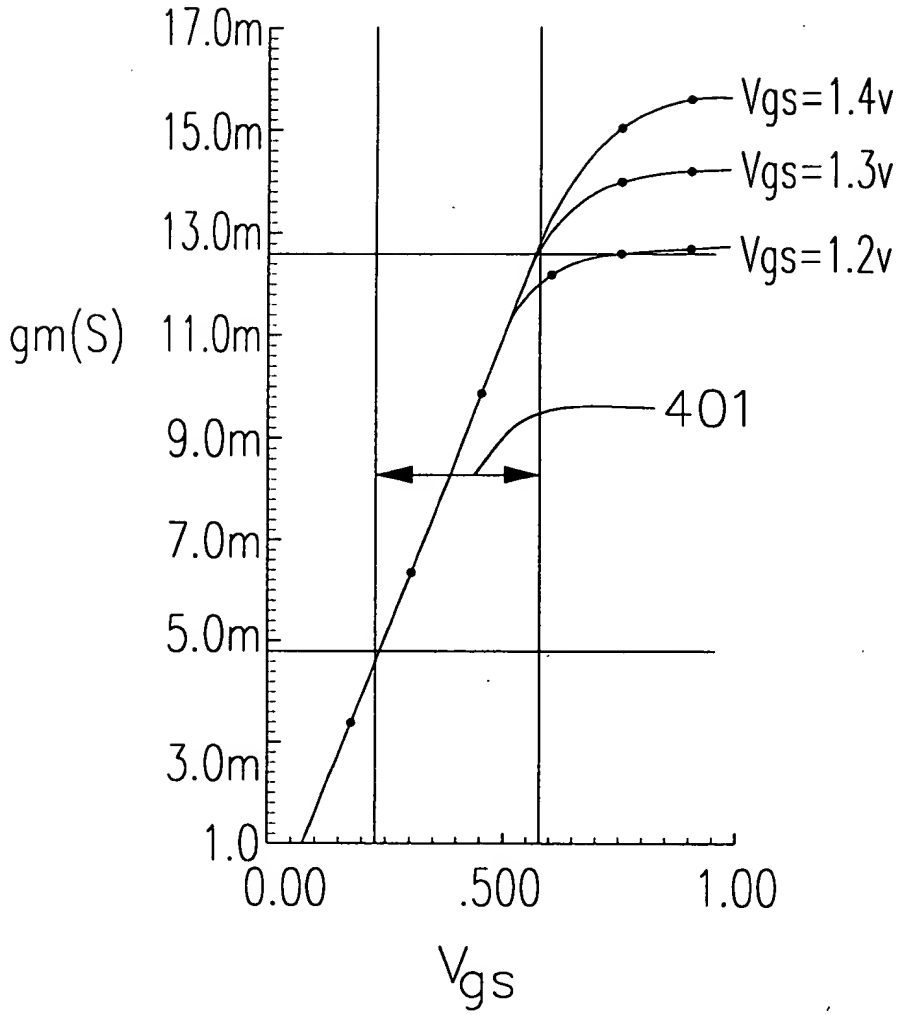

17.0m
15.0m
13.0m
11.0m
9.0m
7.0m
5.0m
3.0m
1.0
gm(S)
0.00
.500
1.00
Vgs
Vgs=1.4v
Vgs=1.3v
Vgs=1.2v
401

FIG. 79

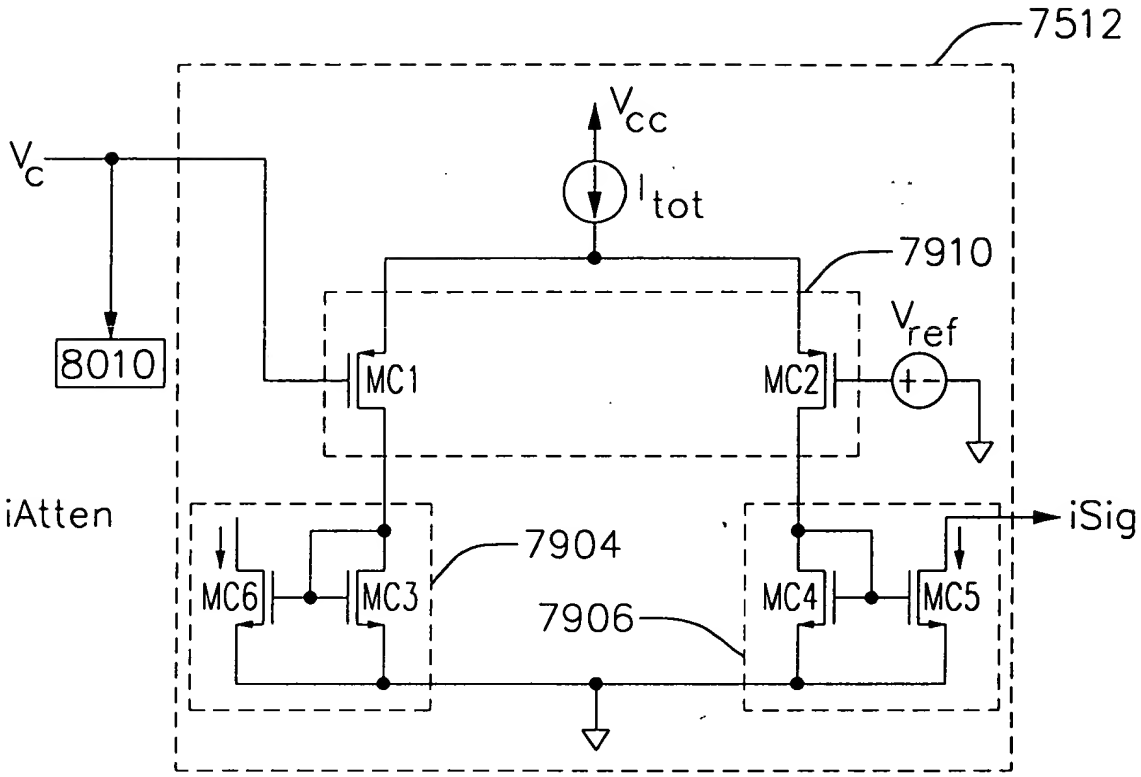
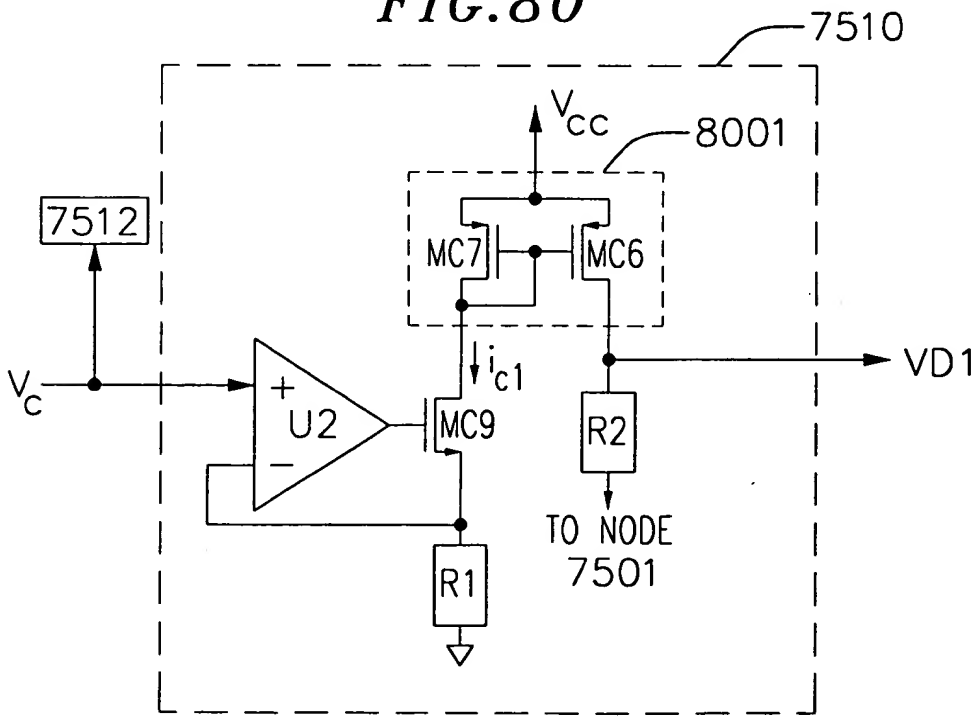

7512
Vcc
Vc
Itot
7910
Vref
8010
MC1
MC2
iAtten
iSig
7904
MC6
MC3
MC4
MC5
7906

FIG. 80


7510
Vcc
8001
7512
MC7
MC6
ic1
VD1
Vc
U2
MC9
R2
TO NODE
7501
R1

DOCKET ONE0220

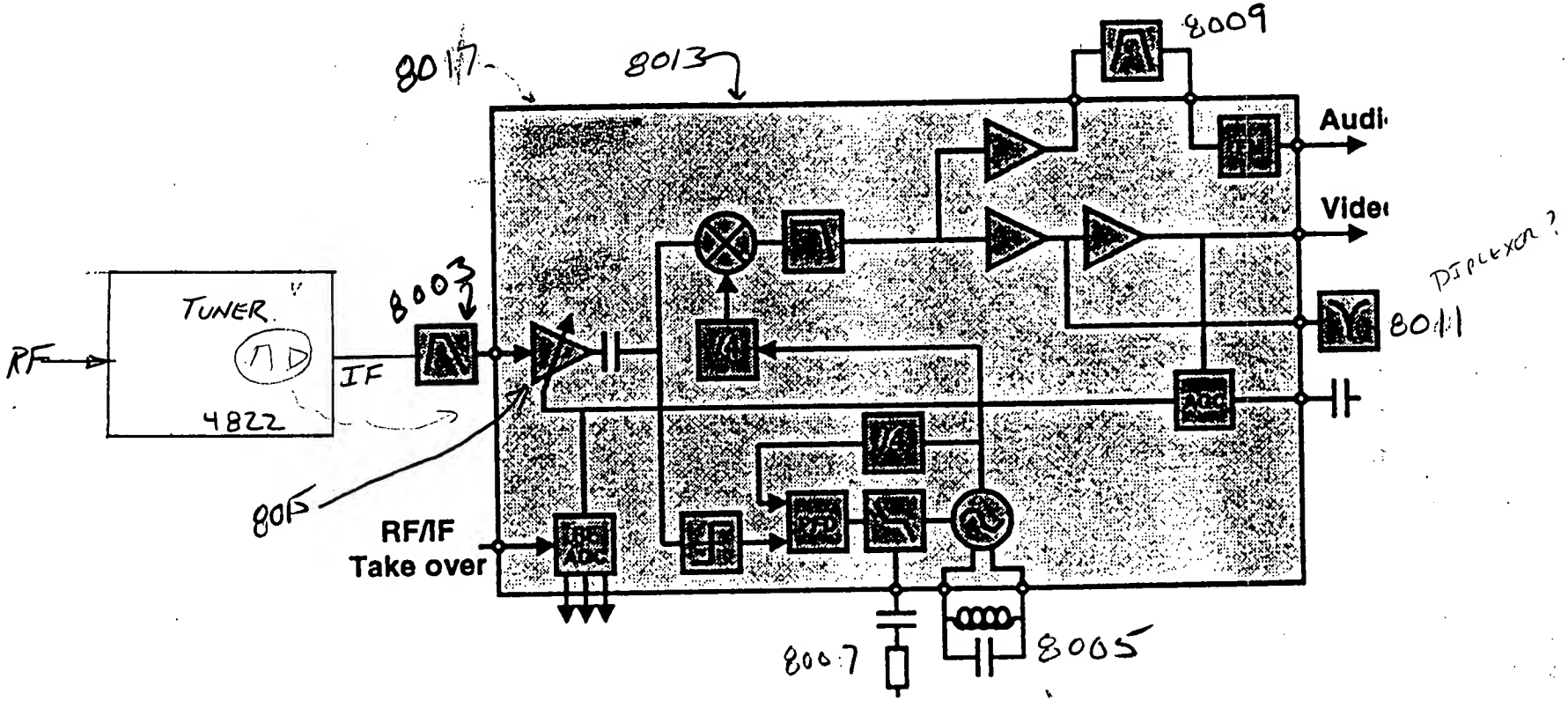


FIG. 81

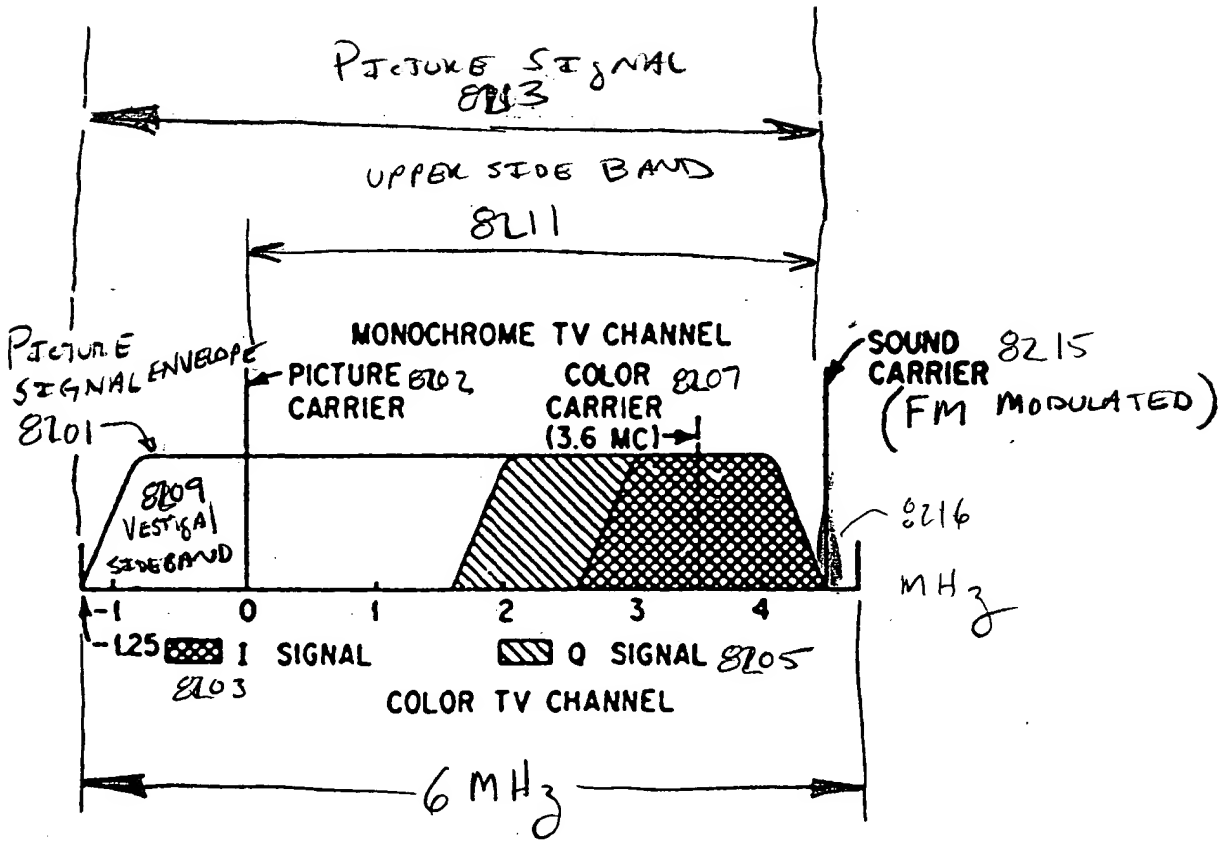

PICTURE SIGNAL
8213
UPPER SIDE BAND
8211
PICTURE SIGNAL ENVELOPE
8201
MONOCHROME TV CHANNEL
PICTURE CARRIER 8202
COLOR CARRIER (3.6 MC) 8207
SOUND CARRIER 8215
(FM MODULATED)
8209
VESTIGIAL SIDEBAND
8216
MHz
-1
0
1
2
3
4
-.125
I SIGNAL
8203
Q SIGNAL 8205
COLOR TV CHANNEL
6 MHz

FIG. 82

DOCKET ONE2200

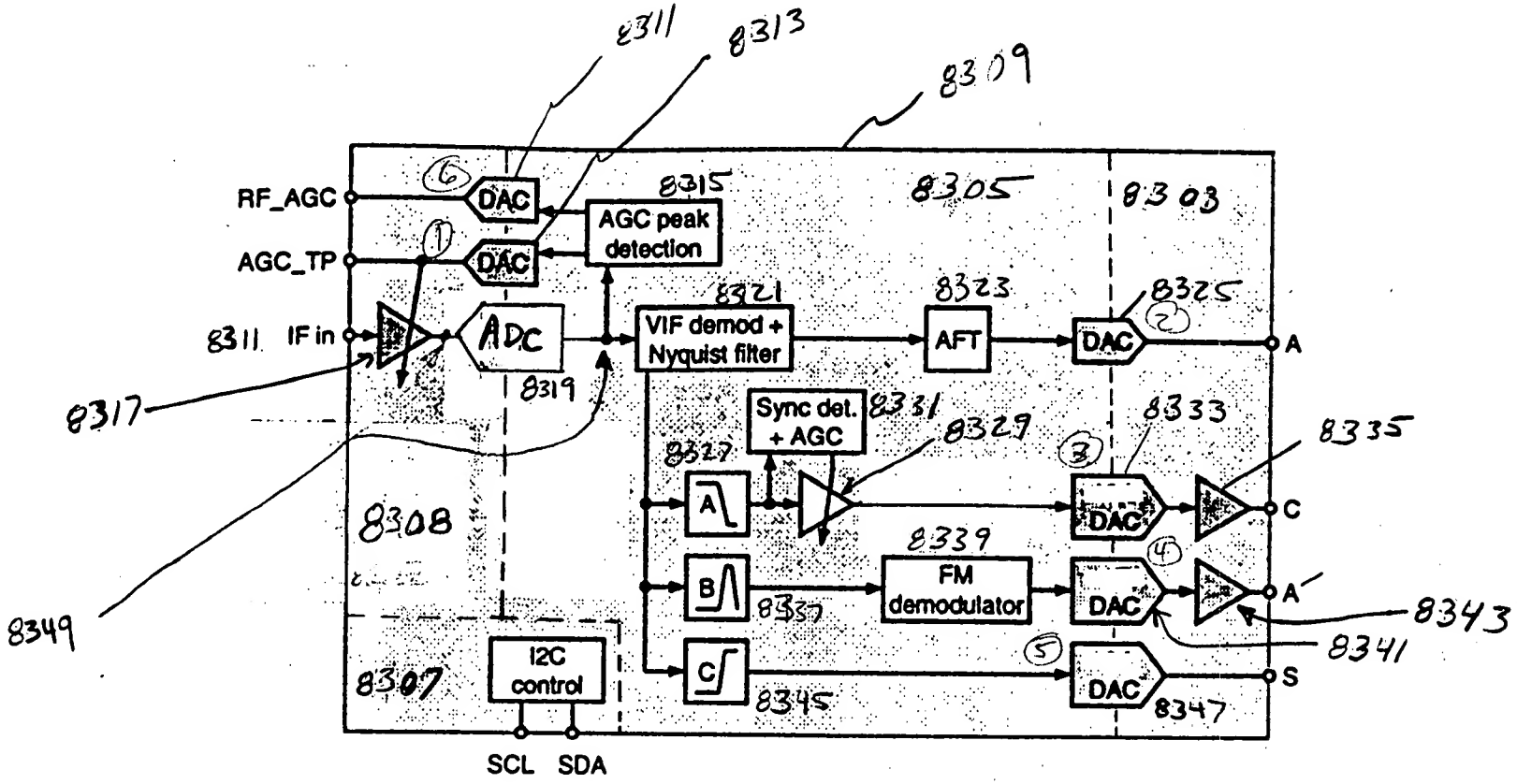


FIG. 83

FIG. 84a

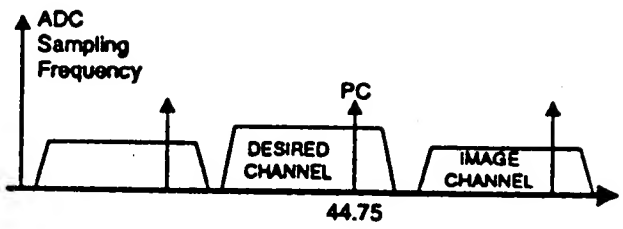


FIG 84b

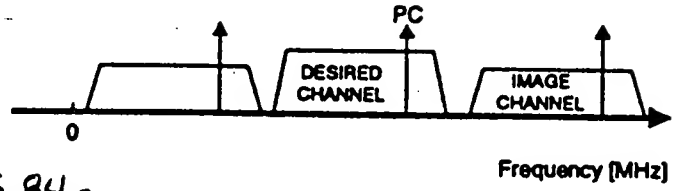


FIG 84c

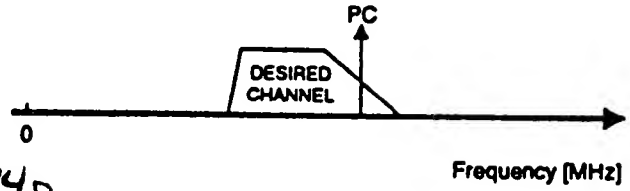
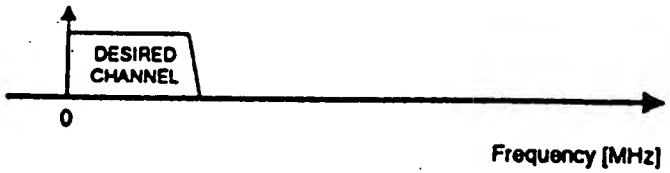


FIG 84D



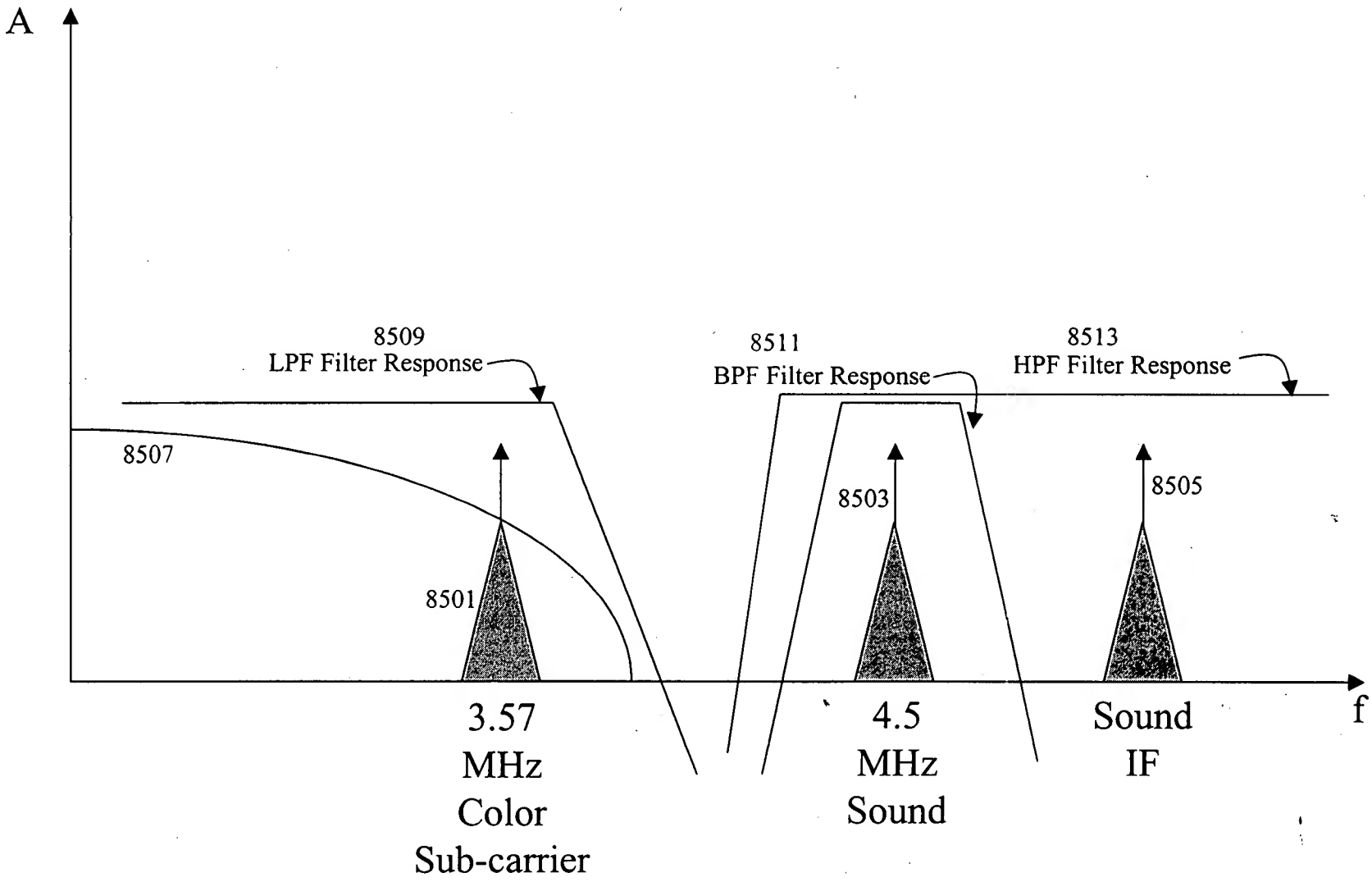

A
8509
LPF Filter Response
8511
BPF Filter Response
8513
HPF Filter Response
8507
8501
8503
8505
f
3.57
MHz
Color
Sub-carrier
4.5
MHz
Sound
Sound
IF

FIG. 85